THE REFINER AND NATURAL GASOLINE MANUFACTURER

OCTOBER, 1926

NEWS INDEX 19
ADVERTISERS INDEX 90

VOLUME 5 NUMBER 10

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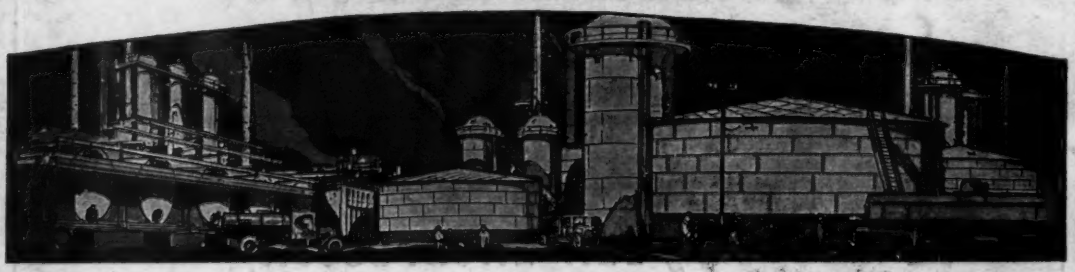


Kaw Refinery Equipment Is Built By Master Workmen

Every KAW product is the result of the expert knowledge and skill of men who are masters of their trade. These men have spent their lives in studying the requirements of the refining industry and in building equipment to better and more economically meet your needs.

KAW Pressure Stills and other KAW steel products are daily demonstrating their super-strength and lasting dependability.

Special specification jobs promptly made to order. A large stock of standard equipment ready for immediate shipment. Write, wire or phone for specifications and prices.

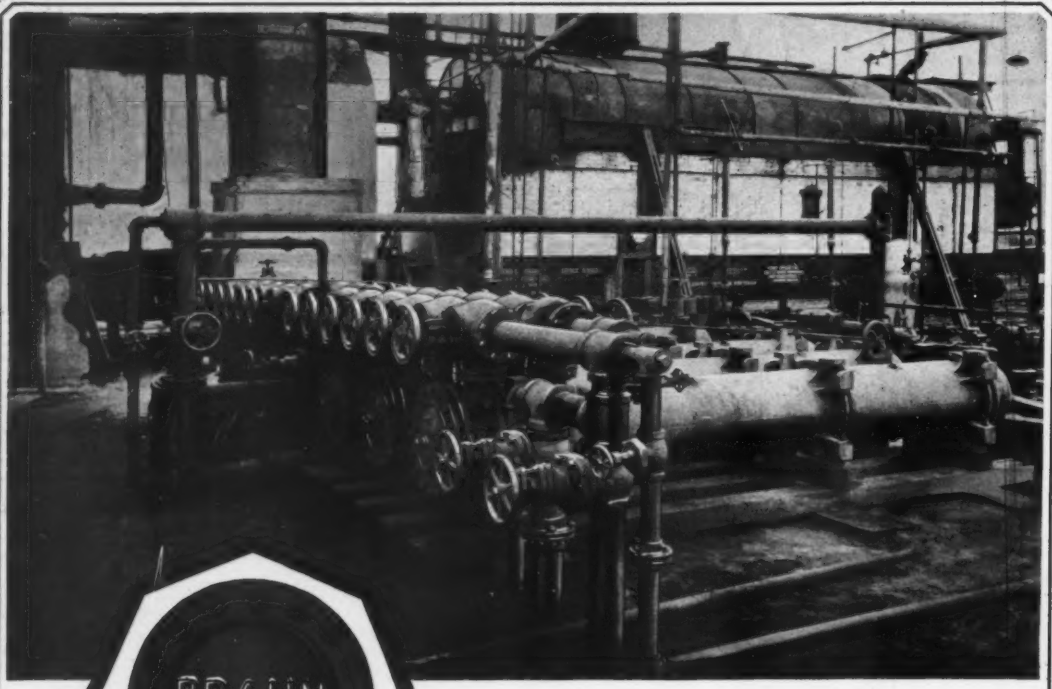
Horizontal Tanks
Storage Tanks
Agitators, Stills

KAW

Condenser Boxes
Rundown Tanks
Towers, Stacks

KAW STEEL CONSTRUCTION CO.

General Office and Plant: 1st and Walker Ave., Kansas City, Kansas



BRAUN

An Interesting Portable Refinery

This is a complete small refinery which is moved readily from one point to another as conditions require. Note that the Braun heat exchangers rest on skids, while the still in the background is mounted on a flatcar.

Braun heat exchangers are giving the highest type of efficient service in hundreds of refineries ranging from the smallest to the largest.

Send for our Heat Exchanger Bulletin.

C. F. BRAUN & CO.
Manufacturing Mechanical Engineers
Tulsa Alhambra, Calif. Dallas

BRAUN
HEAT EXCHANGERS

Entered as second class matter June 16th, 1923, at the Postoffice at Houston, Texas, under the Act of March 3, 1879.

Making Good the Guarantee

Williams Double-Disc Gate Valve No. 127—representing the height of valve service. Ask your dealer for it.

No effort to shirk responsibility! No grumbling over severity of the service demanded! No "ifs or ands" or quibbling of any nature!

Service at a profit! That is the plainly understood proposition on which all **Williams Valves** are sold. Discriminating valve buyers know the **Williams** saves coal, labor, time and trouble, and assures uninterrupted production. Profits from such service are incalculable.

Williams Double-Disc Gate Valve No. 127

is one of the peerless **Williams** line that is famed for abolishment of all waste—for the insurance of a full, steady and leakless flow of Air, Steam, Water, Gas or Oil.

A tight seat is assured by the ball and socket bearing discs that also compensate for any temperature distortion or sagging of pipe lines.

An **exclusive** Williams feature is the Union Ring method of securing the bonnet to the body, providing a rigid, steam-tight joint that cannot corrode.

The heaviest stem used in any gate valve—made of special hard bronze that will not bend or break. Acme Standard threads assure maximum wear and long life. Packing is forced against the stem by a Packing Gland Follower.

Many other features that explain the extremely satisfactory service of Williams Valves are described in our Catalogue 10. It clearly explains why Williams Double-Disc Gate Valve No. 127 always makes good.

Made in two patterns—Medium for 200 lbs. pressure and Extra Heavy for 300 lbs. pressure.. **Satisfaction Guaranteed.**

Catalogue No. 10 mailed on request.

Dealers Carry Williams Valves and Will Fill Your Order for a Sample Promptly.

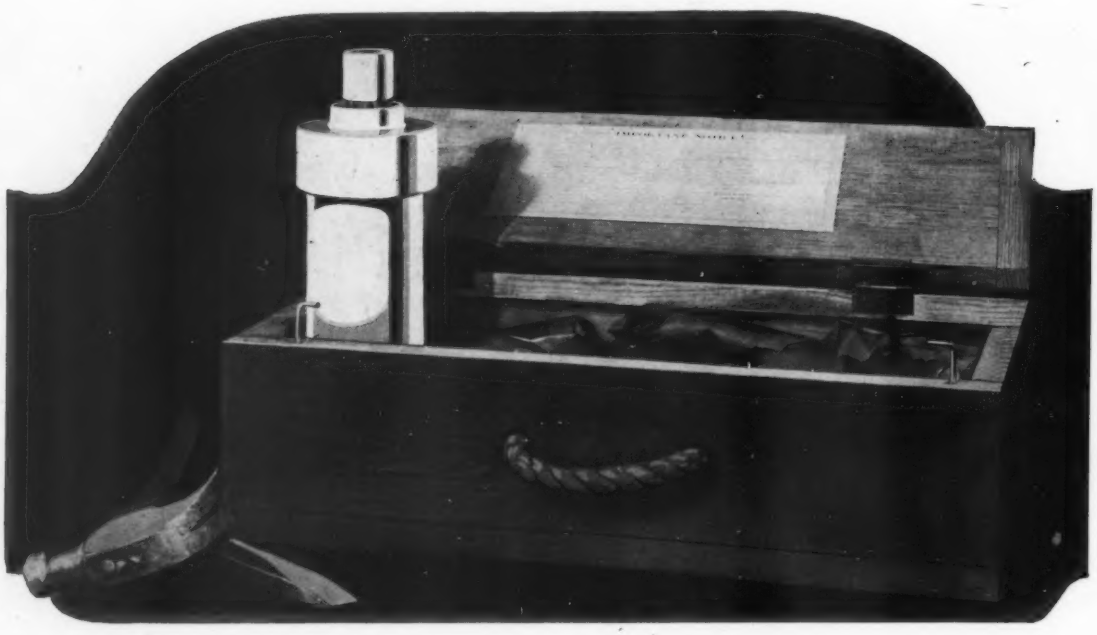
The D. T. Williams Valve Company

Cincinnati, Ohio

Makers of High Grade Bronze and Iron, Regrinding and Nickel Seat Stop and Check Valves, Gate, Blowoff, Hydraulic, Swing and Ball Check, Needle, Hose, Whistle Valves, Stop and Air Cocks, Unions, Fittings, Water Gauges, Gauge Cocks, Oil Gauges, Lubricators, Oil and Grease Cups, Steam Traps, Separators.

Williams Valves

Mention Where You Saw the Advertisement



They come packed in handy kits—

To be sure, the container does not make the tube cleaner, but when Liberty Tube Cleaners,—known for 25 years as most excellent scale removers, come to you in handy kits which can be used as a convenient and appropriate place to store parts and tools incident to tube cleaning, —it is an added advantage worth noting.

In a Liberty Cleaner you are buying safety and economy for boilers, stills and tubular apparatus. The quick, thorough cleaning and conditioning of the tubes, which can only be had by regular cleaning is a fundamental requirement of safe, efficient operation.

You can get a Liberty Cleaner of size and type to suit your operating conditions. Packed in the handy kit, loaded with potential savings.

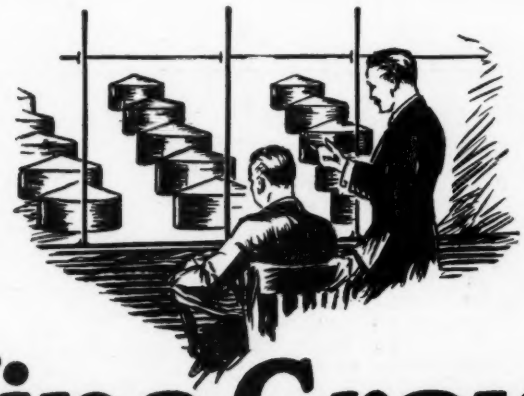
Write for Catalog Z-2

Liberty Manufacturing Company

449 Grant Street, Pittsburgh, Pa.

Z-1033

Mention Where You Saw the Advertisement



"A fine Group of Tanks-*but why don't you* Protect them?"

WE offer the oil industry the most advanced, safest and surest protection against fire and evaporation —*Oceco Equipment*—an outstanding achievement in this field—*equipment with a service record!*

For complete information address "Headquarters" or any of the branches or representatives here listed.

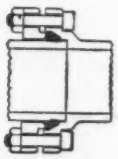
THE OIL CONSERVATION ENGINEERING COMPANY
877 Addison Rd. *Headquarters for Tank Equipment* Cleveland, O.

ENGINEERING AND SALES SERVICE AT:—

25 Broadway, New York
417½ Boulder St., Tulsa, Okla.
O-S Building, Casper, Wyo.
W. K. Henderson Co., Shreveport, La.
Neilan, Schumacher & Co., Los Angeles, Calif.
Arthur Dooley, Box 552, Beaumont, Texas

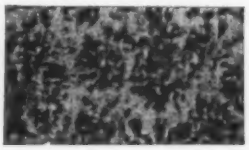
OIL TANK **OCECO** EQUIPMENT
SAVES EVAPORATION AND PREVENTS FIRE

SIMPLEX CAST IRON CONDENSER PIPING

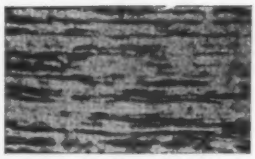


"ONE FLANGE IS LOOSE"

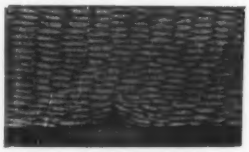
COATS ITSELF



Photomicrograph of cast iron, much enlarged, showing granular structure.



Photomicrograph of wrought iron, much enlarged, showing fibrous structure.



A piece of sheet steel, much enlarged, showing surface and sectional structure with a typical pit.

AUTHENTIC data from over 250 years of service prove that cast iron becomes coated with rust but remains practically unimpaired in weight and strength under conditions that are fatal to other kinds of metal.

Scientists believe this phenomena due to the microscopic structure of cast iron —a structure of the same granular or crystalline form as found in the iron ore from which it is made and which has laid unimpaired in the ground for untold centuries. Cast iron rusts on the surface, but the corrosive agent fails to break the natural mechanical bond between the irregular shaped granules, further oxygen is excluded by the first rust coating, and therefore corrosion stops. Cast iron literally coats itself.

In place of the interlocked grains or crystals of cast iron, wrought iron and steel are of a fibrous and, in thinly rolled steel, of a laminated structure, with distinct leaves overlapping each other. As corrosion takes place, these leaves or fibres scale off, constantly presenting a fresh surface to the corrosive agent.

Simplex pipe is flanged pipe minus the limitations of a joint made with rigid flanges. Thousands of feet of this material has been in use for years by the leading oil refineries of the United States for oil condensers.

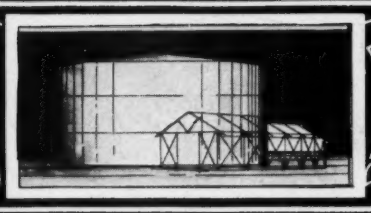
Write for Simplex Condenser Catalog Number 55

AMERICAN CAST IRON PIPE COMPANY

General Offices and Foundry: Birmingham, Ala.

Branches at
Dallas, Kansas City, San Francisco, Los Angeles, Chicago, New York,

Write Also for information on Our Prepared Joint Cast Iron Pipe for Oil Lines



Announcing a New Institution Created by Popular Demand

This new department . . . created by popular demand within the Oil Industry . . . is prepared to furnish PLATE AND STRUCTURAL STEEL CONSTRUCTION . . . vertical and horizontal storage tanks for the producer, refiner, storer and transporter of crude and refined oils . . . tanks with a capacity up to 80,000 barrels . . . completely fabricated and erected . . . fabricated steel and built-up steel trusses.

This department also will specialize in cutting down and rebuilding tanks.

Car Building and Repair Shops

We own and operate car building and repair shops at Chicago, Ill., Tulsa, Okla., and Coffeyville, Kans.

These shops are maintained not only for the purpose of keeping our more than 3,500 tank and refrigerator cars in the highest state of efficiency, but this maintenance service also is offered to those companies operating their own cars.

This service is economical and efficient. We solicit correspondence from those companies having use for it.

Oil Terminal Facilities

Located at Chicago, Tulsa and New Orleans we maintain fully equipped storage facilities for handling all liquid commodities for the convenience of companies wishing storage and distribution facilities for import, export or domestic shipments.

Ocean Terminals maintained at New Orleans for docking ships of any length or draft.

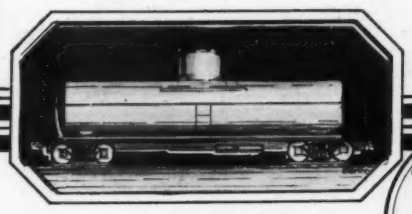
Write Us for Detailed Information Regarding These Services

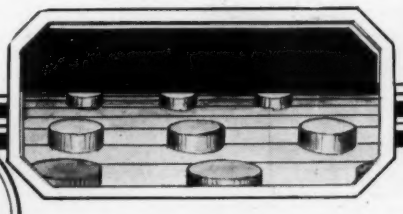
North American Car Corpn.

Henry H. Brigham, President

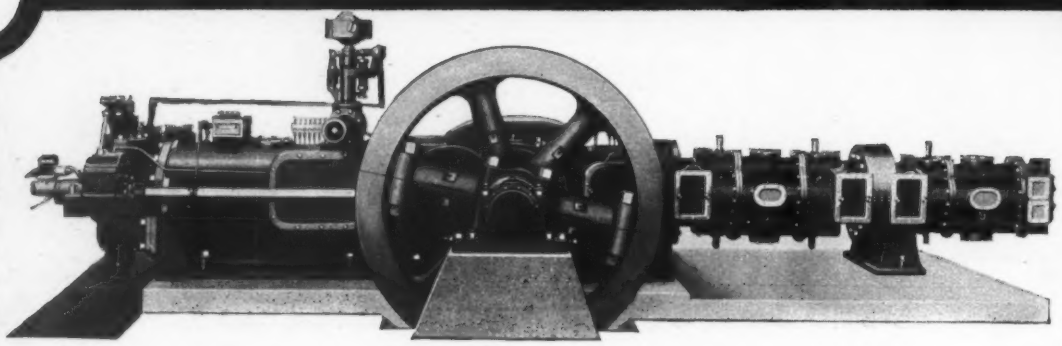
Petroleum Building, TULSA OKLAHOMA

Chicago, Ill. New Orleans, La. Coffeyville, Kansas





NORTH AMERICAN CAR CO.



Bessemers Never Lie Down on the Job

BESSEMER Compressors should be judged by their performance on the job in order to appreciate fully their outstanding efficiency and long run economy. No matter how hard the work may be, or how long the hours, if it's a Bessemer Compressor it will handle it unfalteringly, and at the same time lighten the burden of the operator and save money for the owner.

Bessemer Compressors have built up their reputation of consistent performance simply because they don't lie down on the job. They deliver a steady stream of power from their power cylinders, and their compressor cylinders have a higher compression efficiency than any other cylinder built.

The actual operating efficiency of any Bessemer Compressor (two cycle or four cycle) is such as to welcome the most exacting comparative tests with any others of a similar size and type. The results of a close scrutiny of Bessemers in operation, plus the thousands of Bessemer service records will convince you that you need the dependability and economy of a Bessemer compressor for your work.

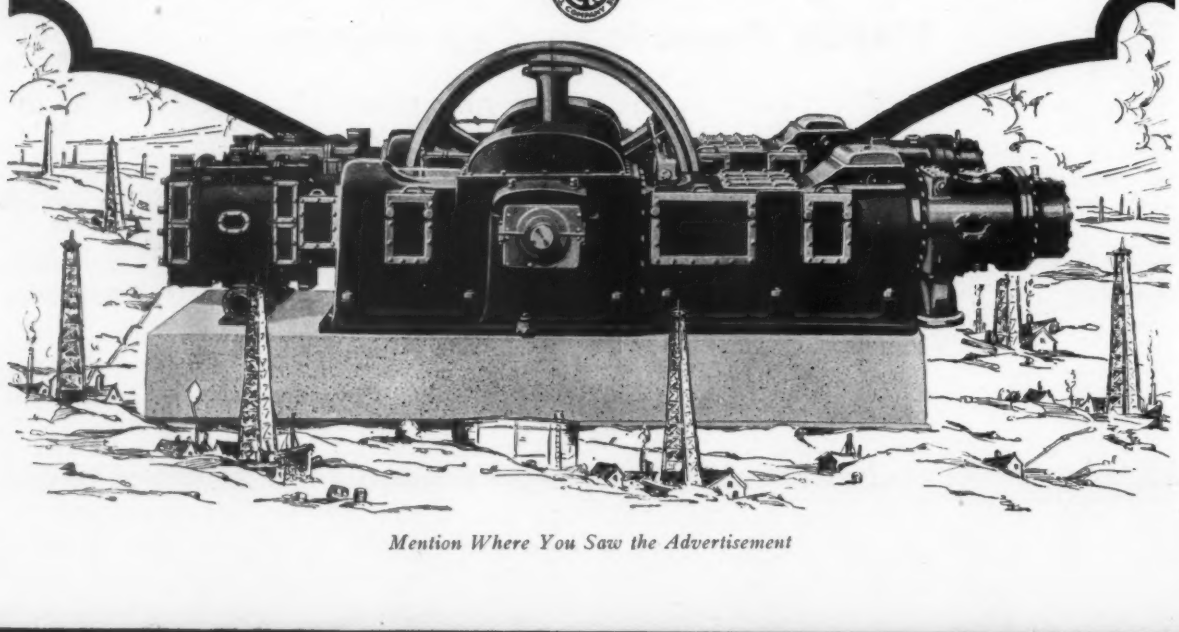
THE BESSEMER GAS ENGINE COMPANY

18 York Street ∴ ∴ Grove City Pa.

California Branch—727-728 Standard Oil Bldg., Los Angeles
California Distributor: Associated Supply Co., San Francisco—Los Angeles

BESSEMER

BESSEMER OIL FIELD ENGINES – COMPRESSORS VACUUM PUMPS – ROLLER PUMPING POWERS



ADAMANT
FIRE BRICK CEMENT
Reg. U. S. Pat. Off.

is carried in stock in 100lb., 250lb. and 400lb. air tight, metal containers by these distributors:

(Distributors listed under name of city. Write distributor in nearest city.)

Aspinwall, Pa.
The Gas Combustion Company
Baltimore, Md.
King's Coal and Supply Company, Inc.
Beaumont, Texas
Norvell-Wilder Hardware Company
Birmingham, Ala.
Young and Vann Supply Co.
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Waldo Bros. and Bond Company
Buffalo, N. Y.
Globe Plaster Company
Chicago, Ill.
Wm. E. Dee Company
Cincinnati, Ohio
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Corpus Christi, Texas
San Antonio Machine & Supply Co.
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H. D. Edwards & Co.
Duluth, Minn.
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El Paso, Texas
Geo. S. Thomson Company
Erie, Pa.
O. C. Thayer and Son
Houston, Texas
Norvell-Wilder Hardware Company
Indianapolis, Ind.
Indianapolis Belting & Supply Co.
Kansas City, Mo.
Union Material & Supply Co.
Los Angeles, Cal.
Industrial Supply Co.
Louisville, Ky.
E. D. Morton & Company, Inc.
Memphis, Tenn.
Reed and Duecker
Milwaukee, Wis.
Tews Lime & Cement Co.
Minneapolis, Minn.
Northern Machinery Company
Mohawk, N. Y.
The American Hard Wall Plaster Co.
New Britain, Conn.
Rackliffe Bros. Co., Inc.
New Haven, Conn.
The Warner-Miller Co.
New Orleans, La.
Woodward Wight & Company, Ltd.
New York City
C. C. Phillips, 110 W. 34th St.
Omaha, Neb.
American Machinery & Supply Co.
Pittsburgh, Pa.
The Gas Combustion Company
Post Office Box No. 1753
Portland, Ore.
The M. L. Kline Co.
Providence, R. I.
B. & H. Supply Company, Inc.
Reading, Pa.
Reading Foundry and Supply Co.
Rochester, N. Y.
American Clay & Cement Corp.
Wm. Summerhays & Son
Rome, N. Y.
The American Hard Wall Plaster Co.
St. Albans, West Va.
Edw. C. Kirk & Sons
St. Louis, Mo.
Reed Railway Supply Co.
San Antonio, Texas
San Antonio Machine & Supply Co.
San Francisco, Cal.
W. E. Musbet Co.
Seattle, Wash.
Cragin & Co.
Spokane, Wash.
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Springfield, Mass.
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Toledo, Ohio
The Toledo Builders Supply Co.
Tulsa, Okla.
Standard Asbestos & Cork Company
Utica, N. Y.
The American Hard Wall Plaster Co.
Waco, Texas
San Antonio Machine & Supply Co.
Worcester, Mass.
Waldo Bros. and Bond Company

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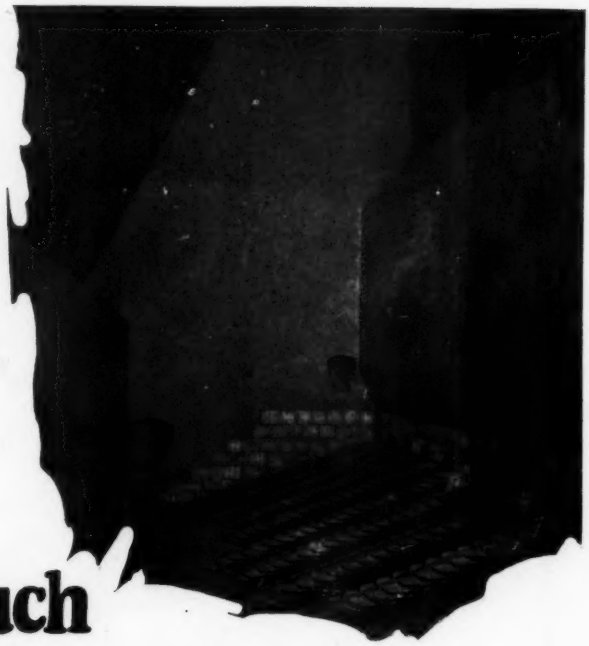
Thomson-Gordon, Ltd.
Montreal, Quebec
Alex. Bremner, Ltd.
Port Arthur, Ontario
Wells & Emmerson
Toronto, Ontario
J. H. Murrison
Vancouver, B. C.
B. C. Equipment Company, Ltd.
Winnipeg, Manitoba
Walter Kelroe & Company Ltd.



Here is one of a number of boiler furnaces in which the brickwork was laid up and "faced" with ADAMANT —making a long serving structure that cuts refractories costs.

How Much Do You Spend For Fire Brick?

Refinery Preference

Only by conclusively proving its merit through long, satisfactory service does a product win the preference of refineries.

ADAMANT is preferred in refineries because it is the ORIGINAL high temperature cement, with the longest record of service. It has proved its ability to prolong brickwork life and reduce refractories repair costs.

SEND for the figures. Find out the annual total of your fire brick purchases.

If you could add 50% to the present life of your fire brick, wouldn't that be a welcome saving?

Consider the greater economy if you could double—or perhaps triple —the present service of your fire brick!

A Mid-Continent refining company tripled fire brick life, thus saving 75% of brickwork repair costs, by laying up their fire brick with ADAMANT, the ORIGINAL high temperature fire brick cement. ADAMANT provided the stronger bond with greatest resistance to the brick-destroying actions of flame, expansion, contraction and other factors.

Why not find out how much you can add to the life of your fire brick, and what you can save in fire brick costs, by using ADAMANT? A test of ADAMANT will tell you. Fill in the coupon below, and mail it to us.

Send The Coupon!

BOTFIELD REFRACTORIES CO.
783 S. Swanson St., Philadelphia, Pa.
New York Office: 5th Floor, 110 W. 34th St.

Botfield Refractories Co.,
783 South Swanson Street,
Philadelphia, Pennsylvania.

We want to find out what we can save in refractories costs by using ADAMANT.

Name and Title _____

Company _____

Street Address _____

City and State _____

Mention Where You Saw the Advertisement

But no truck could break a Pennsylvania Forge Flange

YOU'LL never have a moment's uneasiness about piping troubles after all your lines are equipped with Pennsylvania Forge Flanges.

Gathering and distributing lines, as well as the high-pressure, high-temperature lines of your cracking stills. Steam lines, too. Increased production comes more readily when every part of your plant is free from tie-ups due to leaking pipe joints.

And nothing can damage a Pennsylvania Forge Flange. Not the sudden, violent temperature changes of the chillers—not the racking, internal strains of the high-pressure lines—not the greatest shock of accidental blows.

Ductile as the pipe itself, with three times the tensile strength of cast iron, Pennsylvania Forge Flanges maintain perfectly sealed joints under all conditions. Let us have your inquiry on your next flange order. Quick delivery is insured by our huge stock and tidewater location.

ACCEPT THIS AUTHORITATIVE HAND BOOK

Tables of A. S. M. E. Standards, bends for steam lines, standard pipe specifications, and a mass of kindred data. Write for your copy today. It's free.

PENNSYLVANIA FORGE COMPANY
PHILADELPHIA

Distributors

Houston, Texas: Harrisburg Pipe & Pipe Bending Co.
St. Louis, Mo.: W. R. Maxwell, 915 Olive St.
Phila., Pa.: Ford & Kendig Co., 1428 Callowhill St.
Boston, Mass.: E. B. Badger & Son Co., 75 Pitts St.

The strength of the line is only the strength of the Flanges

PENNSYLVANIA FORGE CO.

Mention Where You Saw the Advertisement

"SOUTHWESTERN" LEADS AGAIN!

An Unparalleled Achievement

A Complete 7,500 gallon unit, In Operation in One Week

The unit shown here is one of the new factory built gasoline absorption plants of 7,500 gallons capacity, designed and built by "Southwestern."

"Southwestern"

First, with the well known portable plant—75 in operation. Now again with the new factory built larger unit.

Efficiency and dependability are built in features of this "Southwestern" factory built plant, which consists of the very latest apparatus of the most advanced type. Every unit completely accessible. Compactly assembled on steel frame in three sections. Numerous advance orders show a real demand for this plant. Once seen fully appreciated. Complete information on request.

SOUTHWESTERN ENGINEERING CORPORATION

1221 Hollingsworth Bldg., Los Angeles, Calif.

837 Mayo Building, Tulsa, Okla.

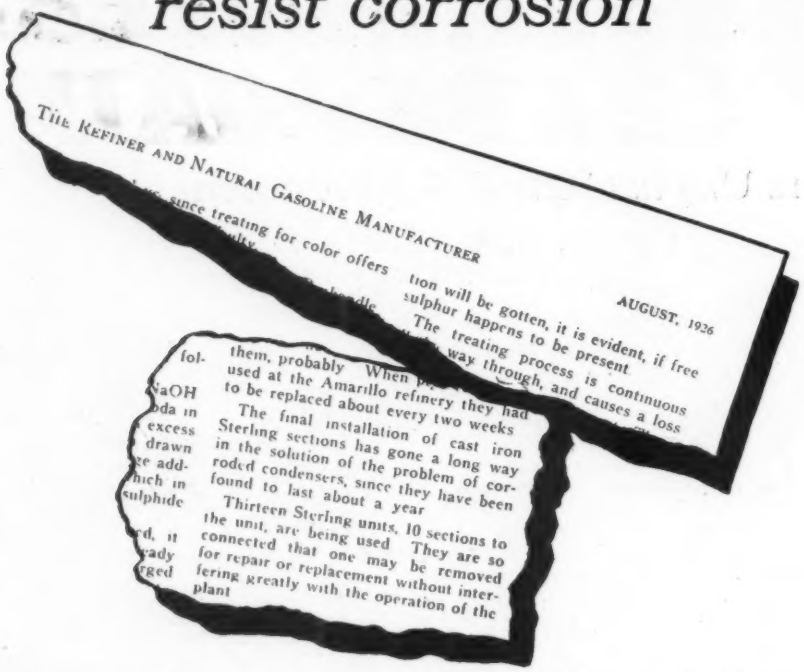
Factory: Culver City, Calif.

Branch Factory: Tulsa, Okla.

"SOUTHWESTERN BUILT" A MARK OF SATISFACTION

STERLING OIL SECTIONS

resist corrosion


THE REFINER AND NATURAL GASOLINE MANUFACTURER
AUGUST, 1926
since treating for color offers
tion will be gotten, it is evident, if free
sulphur happens to be present
The treating process is continuous
way through, and causes a loss
them, probably When
used at the Amarillo refinery they had
to be replaced about every two weeks
The final installation of cast iron
Sterling sections has gone a long way
in the solution of the problem of cor-
roded condensers, since they have been
found to last about a year
Thirteen Sterling units, 10 sections to
the unit, are being used They are so
connected that one may be removed
for repair or replacement without inter-
fering greatly with the operation of the
plant

STERLING Sections and fittings are made from a special mix of metal that is the result of tests in our plants and laboratories and actual operation in the field. That is why they resist corrosion so successfully.

Sterling Sections outlast other types of condensers and at the same time give increased efficiency, increased accessibility and actually cost less. The experience of the Amarillo Refinery is the experience of many other refineries in all oil fields.

We shall be glad to send you our illustrated catalog describing these sections in detail—glad to give you the service of our engineers on request.

STERLING OIL SECTIONS

For manifold use-for continuous use-for cooling

AMERICAN RADIATOR COMPANY

Manufacturers of IDEAL BOILERS *for* OIL BURNING

40 West 40th Street, New York, N.Y. 816 South Michigan Avenue, Chicago, Ill.

Sterling Oil Sections are immediately available at our plants in Kansas City, Mo., and Springfield, Ohio

The Complete Line Facilitates Selection

Iron Body "Ferrenewo" Lift Check Horizontal and Angle

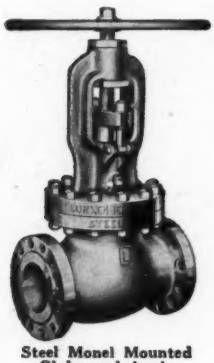
Iron Body Bronze Mounted Globe and Angle

Bronze Regrinding Swing Check

Iron Body "Ferrenewo" Globe and Angle

Bronze "Renewo" Globe and Angle

Iron Body Bronze Mounted Swing Check



Steel Monel Mounted Globe and Angle

Steel Monel Mounted Swing Check

LUNKENHEIMER
Globe, Angle, and Check Valves

are procurable in a wide range of sizes and patterns, for all prevailing pressures and temperatures. No matter what the service conditions may be, the complete line facilitates the selection of the correct valves for any specific purpose.

And when you select Lunkenheimer Valves, you have the assurance that you have an efficient combination of all the factors which insure dependable and economical valve service—correct design, carefully selected materials, skilled workmanship, and the most modern foundry and manufacturing facilities.

Seating surfaces are regrindable, and all parts, including the seats and discs, may be renewed without removing the valves from the pipe line. All valves can be repacked under pressure when wide open.

Lunkenheimer Distributors, located in all industrial centers, carry large stocks, and render prompt service. Call on them for your requirements.

The Lunkenheimer "Guide to Better Service" is a handy reference book, conveniently arranged to enable you to find at a glance Valves for various pressures and temperatures. The center pages illustrate the application of Lunkenheimer Boiler Mountings conforming to the A. S. M. E. Code. Other pages show a variety of Lunkenheimer Engineering Appliances. A copy of this interesting book is yours for the asking. No obligation.

JUST FILL IN AND MAIL THE COUPON.

THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO BOSTON LONDON
EXPORT DEPT. 129-135 LAFAYETTE ST., NEW YORK

THE LUNKENHEIMER CO. "QUALITY" P. O. Box 876, Cincinnati, Ohio
Please send me copy of Lunkenheimer "Guide to Better Service," HJ
Name .....
Firm .....
Address .....

41-1-89

Mention Where You Saw the Advertisement

Service

The Tank and The Delivery!

Vogt Auto Truck Tanks have established such enviable service records under the critical eye of the most careful buyers that quantity orders like pictured above have become ordinary.

In keeping with the service features of the tank, the delivery date is likewise a factor which is never overlooked. Quite often it is considerably anticipated.

HENRY VOGT MACHINE CO.
INCORPORATED
LOUISVILLE, KY.

New York Chicago Philadelphia Cleveland Dallas

Manufacturers of: OIL REFINERY EQUIPMENT, DROP FORGED STEEL VALVES AND FITTINGS, WATER TUBE AND HORIZONTAL RETURN TUBULAR BOILERS, ICE MAKING AND REFRIGERATING MACHINERY.

Mention Where You Saw the Advertisement

SUNOCO

Are you ?

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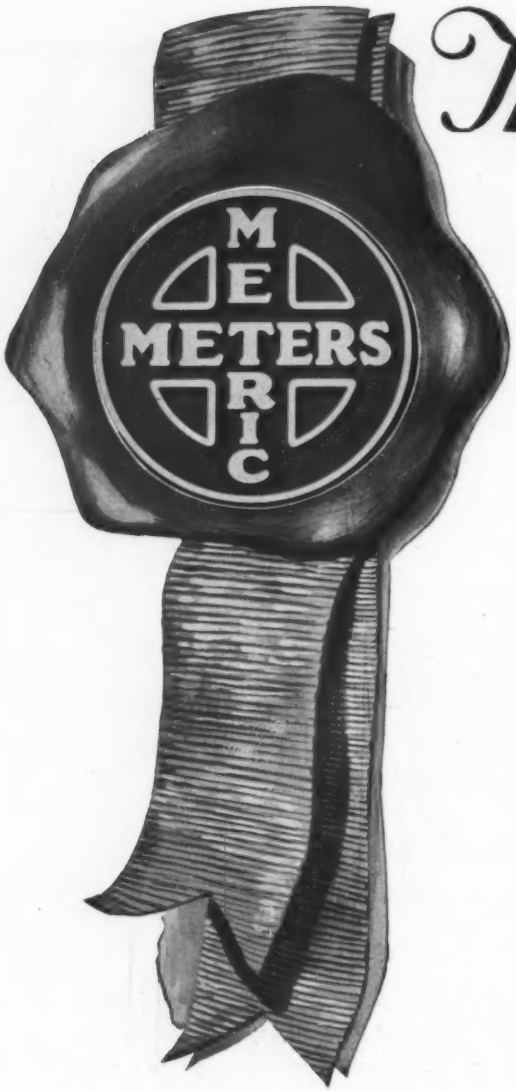

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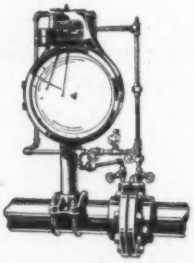

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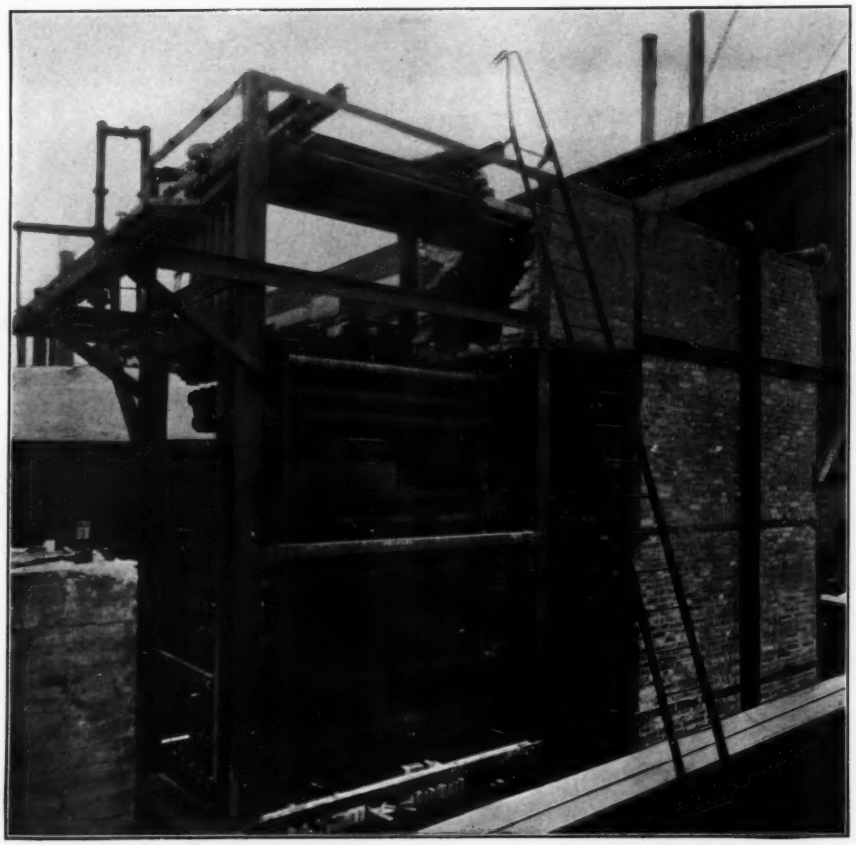

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The new champion weighs 89% more than this "largest still ever built" announced in August

SMITHSTEEL CRACKING STILLS

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Vol. 5, No. 10

SPECIALIZED OIL JOURNALS
GULF PUBLISHING COMPANY
PRODUCING REFINING MARKETING

OCTOBER, 1926

The REFINER
AND NATURAL GASOLINE MANUFACTURER

Edited Monthly at Tulsa, Oklahoma — GRADY TRIPLETT, *Editor*

TABLE OF CONTENTS

EDITORIAL COMMENT 21
MAKING SAFETY AN INDIVIDUAL MATTER 23
By Grady Triplett
IRON CARBONYL HAS ANTI-KNOCK QUALITIES 25
HOW ONE PLANT INCREASED THE WORKING POWER OF ITS STEAM 28
By George Reid
INGENIOUS CONSTRUCTION GIVES RINGLING PLANT HIGH YIELD 30
By Ralph E. Goode
CALIFORNIA MANUFACTURERS MEET IN SEPTEMBER 31
HOW SHALL SMALL REFINERY RESPONSIBILITY AND MANAGEMENT BE DISTRIBUTED 32
By H. L. Kauffman
ENJOYS PROSPEROUS YEAR—PROCEEDINGS OF EASTERN REFINERS' MEET 35
By Roye Munsell
MODERN STILLS 36
By H. S. Bell
WHAT I HAVE LEARNED FROM A STUDY OF NINETEEN BOILER HOUSES 40
By Herbert A. Ross
THE INFLUENCE OF PSYCHOLOGY IN THE OPERATION OF SMALL REFINERIES 48
By Harry R. Lewis
NEW LESSONS FROM AN OLD HAZARD 50
By Houston Dunn
PRODUCTS AND BY-PRODUCTS OF ASSOCIATION WORK 54
By O. P. Keeney
PORTABLE RETORT SOLVES ROAD OIL HEATING 64
DEALING IN PERSONALITIES 62
EXTRACTS OF REFINING TECHNOLOGY 68
MANUFACTURER AND SUPPLY DEALER NOTES 72
RECENT REFINERY AND PLANT PATENTS 80

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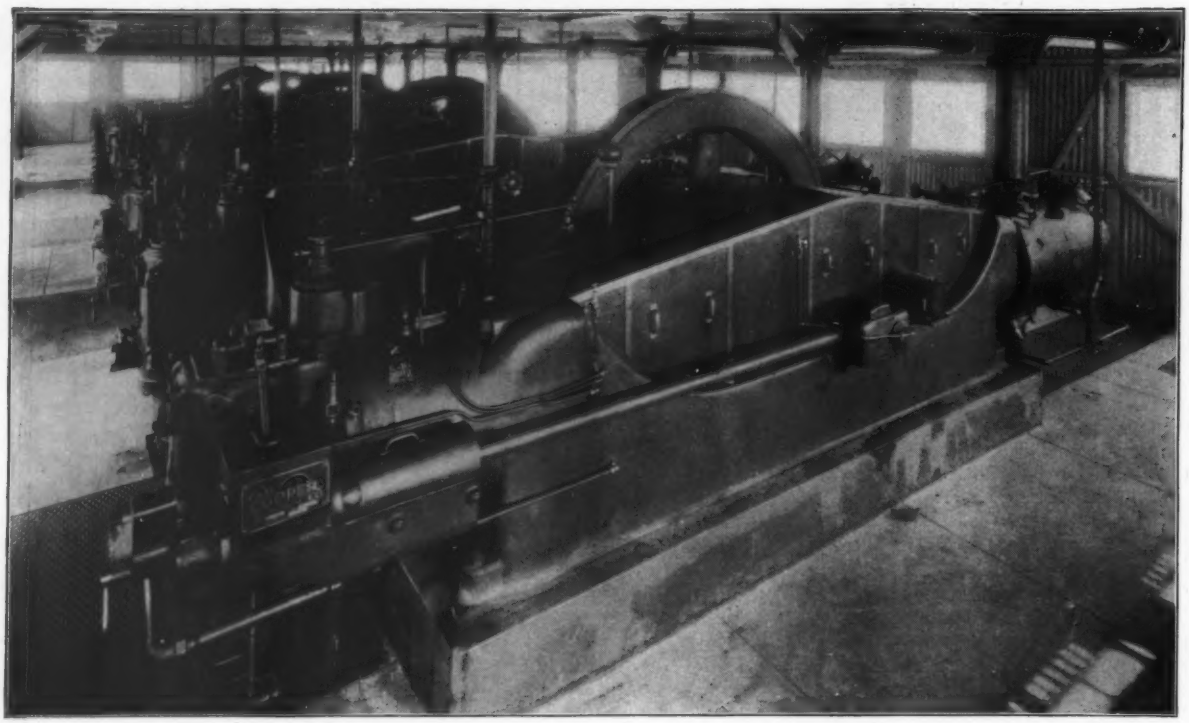
COOPER GAS ENGINES



There is one class of men who never tire of boosting Cooper engines. They are the plant operators and they sum their reasons all up in one word ACCESSIBILITY. To them it means less work, less trouble, more hours on the load, better operating records and greater appreciation from "the higher-ups."

The above installation photograph shows five Cooper Type-80 gas engine driven compressors recently installed by one of the largest oil companies on the Pacific coast.

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EDITORIAL COMMENT

AN Ohio manufacturer has put a truck on the highways, driven by an electric motor, whose power is generated by a Diesel engine. In Philadelphia a concern is building a 40 h. p. Diesel engine for equipping a passenger automobile with a Diesel-electric drive.

These follow operation of locomotives driven by the Diesel engine through electric motor and control.

The first two of these are but experiments. But they point a warning to the maker of gasoline. In the future the demand may be for a less refined oil, rather than a more refined oil.

Engineers do not consider it a difficult thing to equip either a truck or a passenger automobile with the combination Diesel-electric drive. Doubtless there are numerous other efforts to build machines for such power.

Right now this is little more than an experiment. But it suggests the possibility that the automobile fuel of the future may be what is now termed gas oil or fuel oil.

This is just one of the avenues through which engineering and manufacture are striving to conserve the crude oil energy of the world.

GIVE a newspaper reporter a sheet of blank paper and a decrepit typewriter and he can spread more damage with two sticks of type than thoughtful men can repair with a volume.

This observation follows statements in the press that the Western Petroleum Refiners Association and the National Petroleum Marketers Association are to hold a joint session to consider markets.

To those familiar with conditions, such "news" is so ridiculous it is almost comedy. But thousands not properly informed read it and wonder.

Doubtless some man took the effort of a score of Mid-Continent refiners to form an export concern for their products and let his imagination, or ignorance, build it into what the press carried.

But that man is not the only offender. Editors of responsible journals printed it.

No wonder business men grow weary over efforts of the press to record the progress of commerce.

IT is the mental habit of the individual to consider himself handicapped when competing with a large organization. The corner merchant has no chance against the chain store. The owner of a filling station accepts a secondary position to the string of filling stations. And the owner of a small refinery sees his costs and operating methods overshadowed by the gigantic plant.

But there is virtue in being small. Here is the conclusion of H. S. Bell, in his talk on Modern Stills before the annual meeting of the National Petroleum Association in Atlantic City:

"So do not be concerned about the big fellow's costs. If you will use modern methods under good live management, you can do as well or better and a mighty good place to start is the point where the crude oil undergoes the first process, right at the stills."

THE Petroleum Experiment Station, U. S. Bureau of Mines, Bartlesville, Oklahoma, recently announced a revised schedule of First-Aid training classes that are being conducted by the personnel of Training Car No. 6 at refineries and in the oil fields of Oklahoma. Part of this itinerary will be postponed temporarily.

The petroleum industry has indicated a desire to hold a second Petroleum First-Aid Meet during the annual meeting of the American Petroleum Institute, at Tulsa, Oklahoma, in December, 1926. At a conference called by the Petroleum Safety Council of the Mid-Continent Oil & Gas Association, held at Tulsa, Oklahoma, October 1, 1926, twenty or more company representatives signified their intention of entering teams. The Bureau of Mines has been asked to train the teams that enter this first-aid meet.

In order to carry out this program successfully, the personnel of Car No. 6, with the assistance of other trainers, will have to devote its whole time to organizing and training teams until after the contest.

General training will be continued in accordance with the previous announcement at as early a date as possible, and companies will be advised regarding the future itinerary of Car 6. Car 6 will be on siding at Tulsa, Oklahoma, until further notice.

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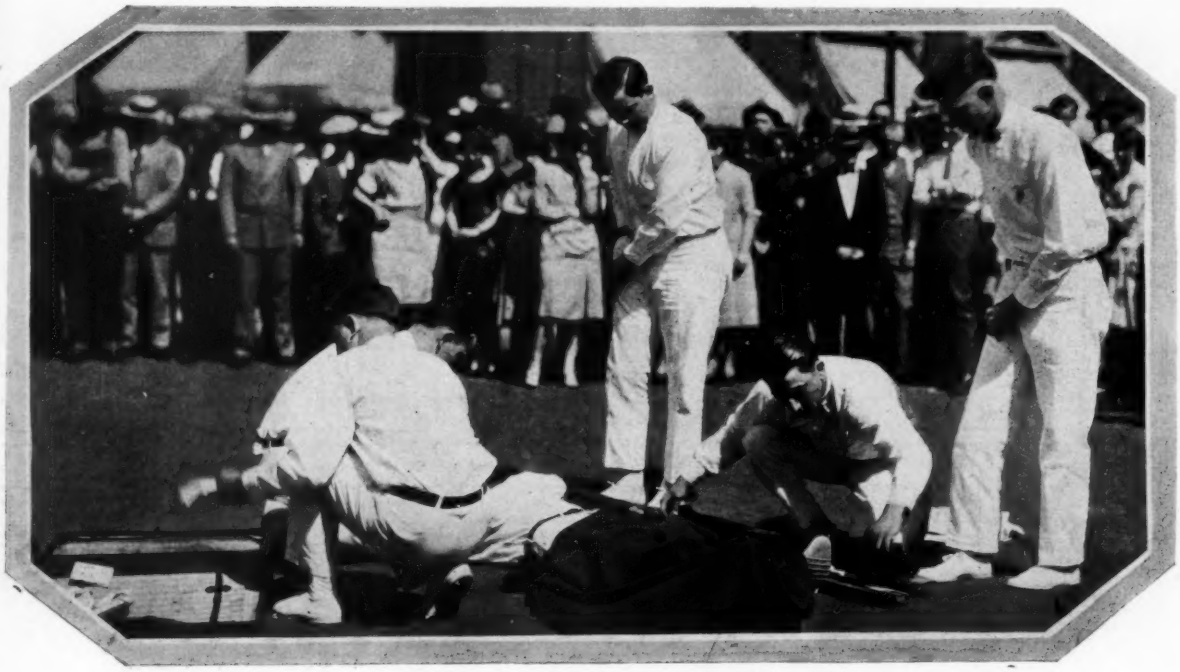


A Phillips safety team "doing its stuff" on exhibition

Making Safety An Individual Matter

Phillips Petroleum Company strives to make each workman realize his responsibility

By Grady Triplett

BEFORE adopting systematic efforts for the prevention of gasoline plant accidents, executives of the Phillips Petroleum Company conducted investigations, which revealed that around 90 per cent of accidents result from workmen failing to take proper care while on duty.

This left at best only 10 per cent of accidents to be prevented by the installation of safety devices. One reason for the low percentage of safety devices is that this equipment may be in place but it does not insure that men will use it properly or even be guided by its presence.

So the major effort of the company, on the score of safety, is directed toward men in the plants. Safety is a human problem to the Phillips Petroleum Company. It may be fitting to class it as a mental problem.

It is also an individual problem, for this concern has found that no gasoline plant is any safer than the most careless and thoughtless man in it. An accident may injure just one man. He may be responsible and suffer for it. But an accident to one man may result in injury to others and loss of property as well. So safety gets down to individuals.

That is the reason this concern has so far maintained its safety program without the direction of a safety engineer. The desire is to place responsibility for proper operating methods on the workmen in the plants. By doing this, it is hoped that the men will come to look upon themselves as responsible for proper working methods.

The safety program of the Phillips Petroleum Company does have the direction of executives. But none devotes all his time to this duty. There is an executive committee on safety work. Its members are F. E. Rice, superintendent of the natural gasoline department of the company; George P. Bunn, assistant superintendent; Fred Gleason, general operating superintendent; A. W. Hubble, mechanical superintendent, and W. G. Hiatt, manufacturing engineer.

The chief duty of this committee is to present the question of safety to workmen in such a style that each workman will appreciate his own responsibility in keeping a plant free from accidents. Before the messages of this committee get down to the workmen, they may pass through the hands or heads of several other men but always the effort is to carry the message of safety in an impressive manner down to the workman.

Here is an example of how a plant superintendent determined what a stillman knew of the fire hazards of his plant. This stillman had been employed at the plant long enough to know all its workings. He had been drilled on what he shoud do in case of a fire.

A Good Lesson

The plant superintendent called the stillman into the office one day and said:

"The plant is on fire. Here are some red strings and some white strings. Tie a red string on each valve you should close and a white one on each valve you should open."

As the stillman left the office, the superintendent noted the time. Since the stillman was under instructions to return to the office on completing his task, the superintendent had only to watch the clock and wait. In this particular instance the stillman was so long about getting to all the valves that the plant would have been destroyed. The man did not know how to perform his duty in case of fire.

Individually that man was a hazard

A sign that greets you at the gate of each Phillips plant

to other workmen. A fire may not happen in a gasoline plant once a year. But when it does happen, a man of that type endangers all other workmen. In the Phillips method of safety teaching, that man either would have to learn his duties better or give up to a safer man.

Where such is possible, the safety executive committee makes teaching a personal matter. Representatives of the Bureau of Mines conduct classes and give lectures on safety work. The Phillips Company has found its men ready to listen to the advice of Bureau of Mines representatives. These experts go into a district and conduct classes in safety and first aid work among Phillips workmen.

Messages Personal

Such efforts bring a message to workmen personally. There is novelty and diversion in the coming of a man from outside the company with a message.

While bulletin boards are used in teaching safety, this concern does not use the accepted bulletins commonly posted on them. Any messages the safety executive committee may have is conveyed by bulletins, posted on boards. But these are largely personal.

Use of bulletin boards is chiefly for reporting accidents and pointing out what accidents happened and how similar accidents may be prevented. It is something of an axiom in the company that all accidents can never be eliminated but those that do occur can be used as lessons in preventing others.

So no accident goes unnoticed by the company. Somewhere along the line it is reviewed. If it is a trivial accident with minor injury and no loss of time, the plant superintendent can conduct the review to determine how it happened. When he has satisfied himself, his next move is to call that man into the office and go over the affair with him, the purpose being to point out the mistake the man made and show how to prevent similar mishap.

Accidents of the more serious type come up for review before the executive committee at the Bartlesville headquarters office. Two objects are in mind in these reviews. One purpose is to learn how the accident came about, so steps may be taken to prevent similar ones. The other object, bearing relation to the first, is to get this message back to plant workmen personally.

The best means of carrying such a message back has been found to be a brief written report on it. In this the name of the man, suffering the accident, is mentioned. This gives the report a personal touch. The man mentioned may be known to a score or a hundred other workmen. When they notice a new message on the bulletin board, the name of a friend assures its reading and further assures that the message will make a lasting impression.

These reviews are brief and pointed. No effort is made to "preach."

This type of marker stands beside each valve of the steam snuff line

No Hurry

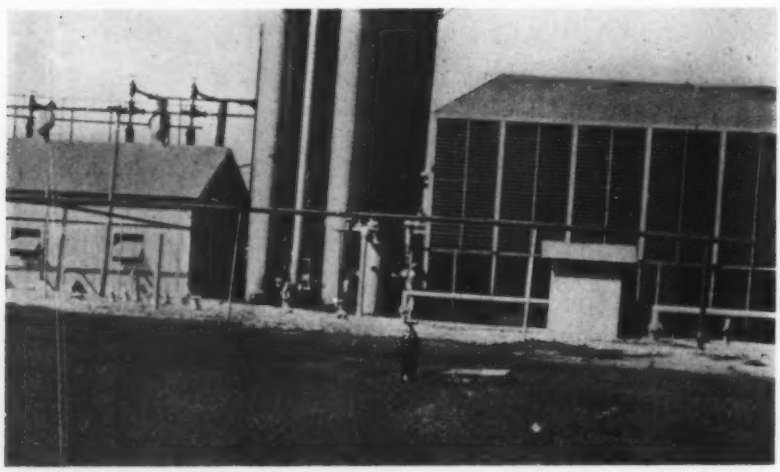
But bulletin boards are not clustered with posters. Those responsible for the Phillips effort to avoid industrial accidents do not consider posters ineffective in teaching safety. They believe other methods more effective. Take an instance of the danger of wearing loose clothing while oiling moving machinery. Many posters are available on that subject.

But the superintendent in a Phillips plant tries to teach that lesson personally. If he sees a man taking unnecessary chances under such conditions, the superintendent calls the workman off and makes it a personal matter. Usually the workman makes the excuse of being in a hurry.

"But," the superintendent replies, "that engine is not needed enough to have you take a chance on getting hurt. Get ready for your job first."

Lessons in safety are taught in that way. And these efforts have brought to light two types of men, who are subject to accidents. One comes in the class of men, who just do not have the proper appreciation of the danger of machinery. It may be classed as aptitude. There are men, so Phillips superintendents believe, who will never

(Continued on page 60)



Fire hydrants are placed so they will be free of access

Iron Carbonyl Has Anti-Knock Qualities

Findings by German engineers offered through translation of article by W. Oswald in Petroleum Zeitschrift

MOTALIN is a gasoline which has been made anti-knock by the incorporation of very small amounts of iron carbonyl. The knocking of the motor is of course a serious condition which results not only in the loss of power but also in injury to the engine. The theories that have been advanced in the attempt to explain what causes the knocking of the motor have been many and similarly quite a distinction has been made between various kinds of knocks in the engine. According to W. Ostwald in his article in Petroleum Zeitschrift, 1926, number 14, from which part of this paper is taken, this does not appear to be admissible.

A distinction should be made between knocking and explosive combustion of the fuel. Mixtures of alcohol for example will burn more gently than benzol. On the other hand benzol will stand up against and will require more pre-ignition than the more explosively burning gasoline. Then again gasoline will burn more explosively, the more high boiling ingredients it contains and the less aromatic constituents, naphthalene, etc.

It is accordingly only experience that teaches that the explosive motor fuels are the ones that will the more readily produce knocking in the engine. The knocking must not however be considered as explosive, rapid combustion, but quite another and entirely independent phenomenon. It is possible to conceive of a motor fuel, which is both "powerful and soft," such as motor benzol and nevertheless this fuel will also readily produce knocking under certain definite conditions. But such fuel is not known at the present time. It is also possible to conceive of another fuel, which burns quickly with explosive violence, such as knocking gasoline but which will not readily produce knocking or hammering in the engine. Motalin is such a fuel.

Why a Motor Knocks

The knocking of the motor is due to the fact that the compression-combustion process within the cylinder is irregular and undesirable, high back-pressures being formed. In this connection considerable information is gained from a study made by Dixon who photographed exploding gases. Under normal conditions the vapors of motor fuel as well as drops of the fuel, heated by the heat released during the compression of the air-fuel mixture in the cylinder, will burn after electric sparking with a moderate degree of speed which can be determined from the chemical character of the motor fuel. The "momentary" combustion, which thermodynamics teaches, does not take place, although the combustion takes place much more rapidly than at the rate determined in bombs, namely 2.5 meters per second. Besides the chemical nature of the fuel the pressure, temperature and the like have important effect on the speed of the combustion process. But the most important consideration is the chemical character of the fuel. This is what is meant by "the soft but powerful" combustion of motor benzol.

This translation from an article in Petroleum Zeitschrift is offered because of the help it may bring to those seeking to overcome the knock in gasoline through chemical reactions.

The author admits that iron carbonyl may present difficulties because of possible action on the working parts of a motor. This part of the experiment has not been concluded. Should such difficulties exist, there is, however, the possibility of their being counteracted.

Chemistry already has contributed materially in freeing motor fuel from knocking. It is one of the fields through which the better motor fuel must be developed.

The Editor.

But when certain determined and definite values of pressure and temperature are exceeded, then "detonation" ensues in the place of regular, progressive combustion conforming to natural law. Detonation is a combustion process which no longer has to do with the specific characteristics of the motor fuel, but which takes place with a speed commensurate with the velocity of sound, namely approximately 600 meters per second. In this case the special properties of these "explosive waves", such as spontaneous ignition due to local compression, increase of the power of the explosive waves by reflex action, etc., result in variations in the pressure and at the same time in very great pressures, this is understandable from the great speed of the combustion.

All these various causes, such as high cylinder temperature, overheated parts in the cylinder, (such as for example poor spark plugs), carbon, pre-ignition, high compression, act in a cumulative manner to bring about the condition of knocking. Any one of these conditions might be at a maximum and hence when any of them is overstepped the results are immediately noticeable in the knocking of the engine, entailing an entire change in the combustion process. In this connection it is easily understandable how too much pre-ignition can produce knocking and this is a condition that applies often to the rapidly burning gasoline and not so much to the slowly burning benzol. It is also understandable how under certain conditions in gasoline-driven motors retarded ignition will not help, for it is not a matter of detonation brought about by the spark plugs, but rather a spontaneous detonation, or rather auto-ignition with subsequent detonation.

Conditions to Overcome

According to the analysis of knocking that has been made above, there are two factors which must be taken care of in order to prevent knocking from taking place. In the first instance there is the auto-ignition, that is ignition independent of the spark plugs, and in the second instance detonation, or combustion at the speed of the velocity of sound.

If it is possible to mtaintain the temperature at which spontaneous ignition of a motor fuel takes place at a high enough point, then it will be found that the motor fuel will not detonate. This temperature is 500 degrees C. in the case of benzol which is almost 300 degrees higher than that of gasoline. In the case of alcohol the spontaneous ignition temperature is only one hundred degrees higher than that of gasoline, and this fuel is not as easily spontaneously ignited as gasoline. The high thermal value of the fuel however serves as an additional protection against spontaneous ignition. This again has the effect of reducing the compression temperature and thus here is another condition which works against detonation.

The new "chemical brakes," the selenium, tellurium compounds, tetraethyl lead, the organic iodine and nitrogen compounds and also motyl, do not have any effect in preventing spontaneous ignition. Tests have shown that gasolines admixed with all these substances still retain their original spontaneous ignition temperatures. Only substances such as benzol, alcohol and water, as well as methanol, isopropyl alcohol, acetone, etc., can increase the spontaneous ignition temperature of gasoline and thus prevent spontaneous ignition.

On the other hand these aforementioned substances are active in preventing that worst of all the results of spontaneous ignition, namely detonation, and in spite of the spontaneous ignition, which still results, they are able, when admixed with the gasoline, to cause the latter to burn regularly.

In studying the question of the knocking of the motor, it must be remembered that there have been two developments during the past few years which have resulted in conditions that rather favor the knocking of the motor. In the first place the gasoline produced today is not the gasoline of former years, just driven out of the crude oil by distillation. Due to the great demand for gasoline motor fuel it has become necessary to decompose higher boiling and higher molecular

weight hydrocarbons in the petroleum to give sufficient supplies of gasoline to meet this demand. Then again, certain developments have been followed out in the design and construction of the engine along the lines of higher compression in the cylinder. Thus it may be said that the gasoline of today knocks more intensely than that of yesterday, and the same holds true of the high compression motor of today compared with the motors of former years.

Must Improve Fuel

It is not necessary to go into much detail as to the results of knocking of the motor. It is well known that the motor parts, particularly the piston rings, the piston and the piston rod are materially injured and sometimes broken. In fact sometimes cracks are found in the cylinder block.

As far as the motor design is concerned, it is evident that there is no desire to go back to the old designs of motor. There are too many advantages connected with the present high compression motor to give it up. It thus remains that the solution of the problem lies in the gasoline, that is any attempt to overcome the knocking of the motor must involve improving the gasoline. The gasoline must be made free from knock. However, it has been known for a long time that there is no such thing as a knock-less motor fuel, which can be admixed with the gasoline either for preventing or alleviating the knock. Then again, while such fuels as benzol do improve the gasoline from this standpoint, there is unfortunately not enough benzol available to mix with the gasoline. Thus there is developed the condition that whatever substance is employed for removing the knock in the fuel, it must be one that can be made available in large quantities.

Investigations were undertaken and the anti-knock media were discovered, and in the use of these substances the important distinction is made that only the smallest quantities need be added to the gasoline, in contradistinction with the so-called knock-free fuels, in order to prevent knocking. Tetra-ethyl lead is well known in America as such a substance and has caused quite a lot of discussion from the standpoint of its alleged poisonous qualities. In Germany the anti-knock compound, corresponding to tetra-ethyl lead, is iron carbonyl.

Iron Carbonyl

Iron carbonyl has the formula of Fe $(CO)_5$ and was first discovered by Mond Quincke and Berthelot in 1891. However the manufacture of this substance entailed considerable trouble and the yield was very small, and so this new chemical was of academic interest only for a long time. It was only in the year 1922 that it was demonstrated that it was a comparatively easy matter to prepare several cubic centimeters of this substance, but manufacture on a large scale was not possible at that time.

The Badische Anilin & Soda Fabrik however undertook to develop a process for the commercial manufacture of this

Figure 1
Combustion of air, water and gas mixture without Iron Carbonyl

substance, as it had observed its anti-knock properties and after considerable intensive research it developed such a method. This method depends on the use of high pressures, something that this company had had experience with in Haber synthetic ammonia process. It is said that the capacity of the plant at the present time is sufficient to render all the gasoline used in Europe free from knock.

Iron carbonyl is a reddish yellow liquid with a specific gravity of 1.45 and a boiling point of 103 degrees C. It solidified at minus 20 degrees C. Its vapor tension is approximately thirty millimeters of mercury at 20 degrees C. Hence it vaporizes with ease along with the gasoline in the carburetor. It can be mixed with most of the organic solvents and it mixes with gasoline in all proportions. It is a particularly stable substance, when it is protected from light rays. It decomposes however when subjected to light, but the decomposition is much slower in diffused light than in direct sunlight. The decomposition is manifested in the deposition of the yellow crystals of iron non-carbonyl.

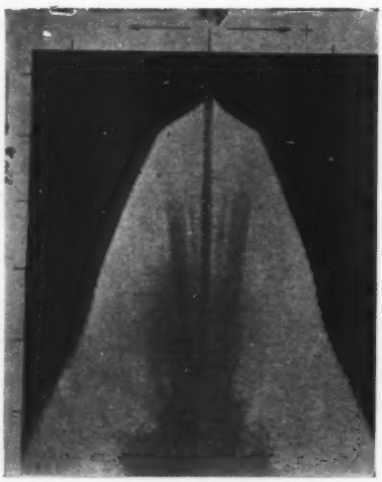


Figure 2
Combustion of air, water and gas mixture with Iron Carbonyl

Iron carbonyl has the remarkable property of influencing the combustion phenomena which takes place in the cylinder of the internal combustion engine in a very important manner. Figures 1 and 2 show the action of a very small amount of iron carbonyl added to a mixture of air and water gas as far as its combustion is concerned. The gaseous mixture was enclosed in a glass tube of approximately 1.2 meters length and ignited by means of an electric spark which was discharged between electrodes located at the center of the tube. The flame spreads out uniformly both below and above the point where the sparking took place. The photographical representation of this phenomenon was made by means of a photographic plate, which was marked with equidistant lines indicating units of time and it was placed in a helium tube located at a definite distance from the combustion tube. Figure 1 shows the combustion without the addition of iron carbonyl, and figure 2 shows it with the addition of this chemical. The manner in which the combustion is affected by the carbonyl compound is easily seen from these two illustrations. While according to figure 1 the combustion was in the nature of a blast of flame and was completed at the 2.5 time mark, on the other hand the combustion, as seen from figure 2, is so slow that it extends over the 5.5 mark in the time scale. In other words it takes 5.5 units of time for the combustion to spread over the same distance that it took the flame 2.5 units of time when no iron carbonyl was present in the mixture. Furthermore the narrow streak which is shown on figure 1 and which is a picture of the flame indicates the quick ending of the combustion while the picture in figure 2 indicates that the flame was spread over a much greater area. In figure 3 there are shown two curves which also describe the course of the combustion when iron carbonyl is added to the mixture and also when it is absent.

The effect of the carbonyl compound is thus clearly demonstrated.

It has been held by some that knocking in a motor is brought about by the fact that the normal combustion of the fuel is suddenly converted into detonation. The gaseous waves, possessing an extraordinarly great velocity, in striking up against the walls of the cylinder produce a metallic sound, the familiar knock. Of course it is understandable that the pressures that are generated in the sudden detonation of the fuel are not permissible in the cylinder and eventually result in its material injury.

The prevention of the knocking of the engine by the addition of iron carbonyl to the motor fuel must be viewed in the same light as the slowing up of the combustion of the mixture of air and water gas, as has been described above. However, when considered more carefully, it will be seen that the actual conditions within the cylinder of the engine are somewhat different. There are certain points in the mechanism of the phenomena

that take place during the combustion of fuel treated with iron carbonyl that have as yet not been satisfactorily explained. There are, however, many possible explanations that can be given for them based on purely theoretical reasoning.

One theory which appears to be endowed with more than the usual degree of probability states that the combustion phenomena take place under catalytic influence. The effect of the catalyst is to cause regular combustion of the carbon chains, that is their oxidation, without these chains being broken down into smaller pieces. It is however still impossible to tell which of these theories is the correct one, or to determine which of the co-acting factors are the important ones.

Effect on Combustion

However, one thing is sure and that is that the addition of the carbonyl compound has an effect on the combustion of the motor fuel and results in the elimination of the engine knock. From the foregoing definition of knocking of an engine, it is manifest that the knock takes place during the combustion of the fuel, and hence it follows that it is immaterial just how the combustion is effected. In other words it makes no difference if the combustion is caused by the spark from the spark plugs, by incandescent parts of the interior of the cylinder or by the heating effect that is induced by compression of the gaseous mixture in the normal cycle of the engine. The only important point that must be considered in the use of iron carbonyl is that the correct amount is added. It will be remembered that this is also the important consideration in the making of an anti-knock motor fuel composition by the addition of benzol to gasoline.

The effectiveness of iron carbonyl is said to be very marked indeed. Thus, while forty liters of benzol must be added to sixty liters of gasoline in order to obtain an anti-knock fuel, namely to the extent of 66 per cent, it is necessary to add only 0.20 to 0.25 liters of iron carbonyl to one hundred liters of gasoline in order to obtain the same effect, or from 0.20 to 0.25 per cent.

Another method of using iron carbonyl is to make a concentrated mixture of this substance with gasoline, in which fifty per cent of each are present. This is known as motyl and when added to the gasoline used in the motor engine, the fuel is known as motalin.

Further investigations have also been made on the behavior of the motalin in the cylinder of the engine, not only in the respect to the mechanism of the combustion phenomena but also with respect to the oil. The question is does it introduce disadvantages in addition to its well-known advantages. The information that is given below on this question was obtained from an actual test made on an automobile which was run for one thousand kilometers on motalin fuel.

Cautions

Thus, as far as the contamination of the oil is concerned, it was found that the motalin fuel did not act any differently from ordinary gasoline and no special bad effects were due to the presence of iron carbonyl in the gasoline. It was also found that the composite fuel did not clog up the needle valve in the carburetor any more than ordinary gasoline. These valves will clog up of course where dust-laden air is drawn into the carburetor but the finely deposited iron nonyl corbonyl, which results on decomposition of the iron carbonyl due to exposure to light, is too fine to remain in the valve and is drawn along with the mixture of gas and air into the cylinder. Of course the nonyl iron carbonyl compound is inactive and does not help the combustion in any manner. It is therefore advisable to see that as little of it is formed as possible, which means keeping the motalin and the iron carbonyl itself in the dark away from contact with light rays.

There still remains to be considered a new problem which arises from the use of iron carbonyl in the gasoline and this refers to the formation of iron oxide in the cylinder due to the combustion and decomposition of the carbonyl compound. Iron oxide is formed both over and under the piston. It must be remarked that the quantity of iron oxide formed is both large and voluminous. Thus in one liter of motalin there are as much as two cubic centimeters of iron carbonyl or 2.8 grams. This amount of iron carbonyl contains 0.8 gram of iron which yields 1.14 gram of iron oxide. The question is what becomes of this oxide?

It is safe to say that the greatest part of this oxide is carried along with exhaust gases out of the cylinder. Hence if the exhaust valve, the exhaust pipe or the muffler becomes clogged up with the fine oxide, the injury is not a very serious one and it is a simple matter to clean out the oxide.

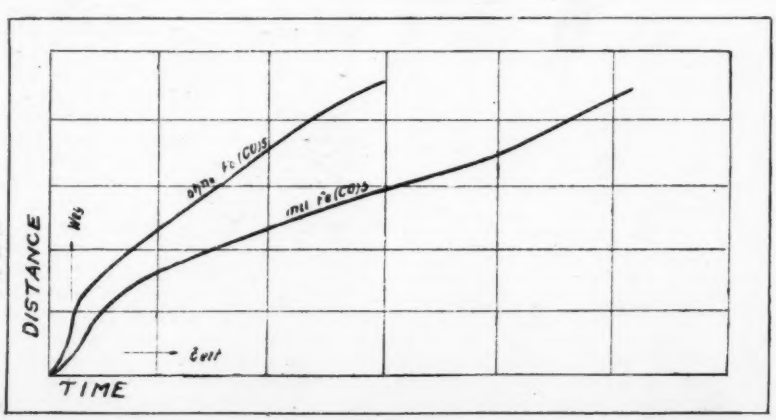
Another part of the oxide is precipitated on the walls of the cylinder and on the piston head as well. The layer is not a thick one if the gasification of the gasoline is properly achieved, and the top portion of the oxide is always being removed. When rich mixtures are employed in the cylinder, then it is found that a reddish-black carbon will be deposited in the cylinder.

Possible Disadvantages

Still another part of the iron oxide formed in the combustion of the motalin-containing gasoline covers the spark plugs, a fact which is quickly noticed after the engine has been run for comparatively few miles on motalin fuel. The question naturally arises as to whether or not this deposit of iron oxide will affect the proper ignition of the fuel in the cylinder.

It is also a question whether or not reduced metallic iron or hard iron carbide is not deposited on the exhaust valve seat, which is of course a very disadvantageous proposition. It is a fact that the high gloss of the seat of the valve, which is evident when it is first ground and polished, soon disappears as the engine is used, and then the seat is roughened to a greater or lesser degree and thus forms a surface upon which the reduced spongy iron can adhere. However, it has been claimed by the makers of the motalin gasoline that this does not happen, and that the iron oxide which is deposited in the cylinder is carried away by the circulating lubricating oil, which soon assumes a decided red coloration. The fineness of the particles of iron oxide is very great and in fact so great that they are almost of colloidal character. This is the reason why it is claimed that the lubricating oil that is admixed with these finely pulverized particles of iron oxide possesses a greater lubricating power than the pure oil, on the same theory that a graphitized oil, that is one mixed with collodial graphite, is a better lubricant than the straight oil. It is also claimed that iron carbide does not form under the iron oxide and hence the disadvantages that are assigned to the presence of this substance in the cylinder are absent.

Of course another problem immediately suggests itself and that is does not the oil, which is combined with colloidal iron oxide, granted that this substance is present in the colloidal condition, present the danger that the narrow pipes and passages in the oiling system will be clogged up, which would of course seriously damage the engine and reduce the value of the motalin. This question cannot be answered at the present time, for investigations are under way to clear up this point in the use of motalin gasoline. But if this par-



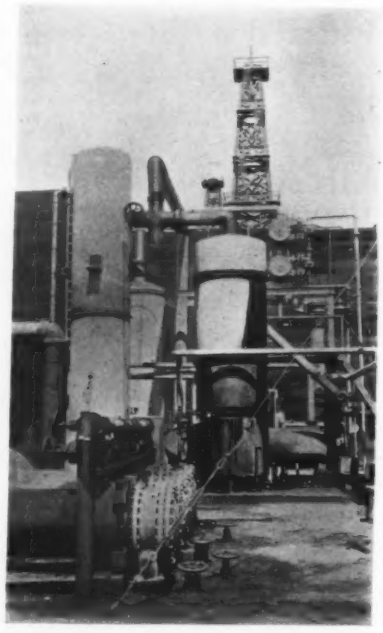
How One Plant Increased the Working Power of Its Steam

Better equipment and efficient operation require but quarter pound of steam for each point of gasoline

By George Reid
Staff Representative

THE absorption plant of the O. C. Fields Gasoline Company at Huntington Beach, California, located in the heart of the so-called old field is producing daily an average of 11,000 gallons of gasoline from approximately 4,500,000 cubic feet of wet natural gas. The average gasoline content of the wet gas run to and through the absorption plant based on the standard charcoal test at atmospheric pressure conditions indicates a possible yield of 2¼ gallons of gasoline per 1000 cubic feet, and as the average yield of plant operations show a recovery of 2.6 gallons per thousand feet of gas treated, the efficiency of the recovery equipment is significant and evident of satisfactory results. Plant efficiency, however, can not be measured in terms of gallons of gasoline recovered per thousand feet of gas treated without giving consideration to the cost of producing that yield. Other than the usual item of operating cost, such as the equipment, maintenance, labor and supervision, and other fixed charges, is the very important item of steam, its generation, fuel consumed and volume used for the production of natural gasoline.

Before going into the discussion of the experiments and findings of the company's field engineers relative to fuel and steam consumption it may be well to briefly describe the operation and equipment of the gasoline plant.



Exchanger, preheater and stripper equipment with water cooling tower in rear

Plant Operation

The wet natural gas from the field is first scrubbed and then handled through four Clark compressors, 80 horse power, size 16 inch by 20 inch by 20 inch, which gather the gas under a vacuum of 12 inches and discharge it to the absorbers through a second scrubber at a pressure of 20 pounds per square inch. The compressors, obviously greatly overloaded, perform this work quietly and efficiently. From the second scrubber the gas under 20 pounds pressure is conducted to two Boner and Sheldon type absorbers, each of which handled over 2,000,000 cubic feet of gas daily. The equal distribution of gas to the absorbers is accomplished in the usual manner with regulation and control devices. The absorption towers of this type are the usual equipment of the engineering firm mentioned consisting of an ingenious arrangement of baffles, plates and screen devices which are very similar in arrangement and working principle to the conventional bubble tower. Liquid levels are maintained on each of the numerous trays by means of both cup and downspout overflow devices and specially placed weirs for control of both the level of the liquid as well as it flows through the tower.

The dry gas, after this operation, is released here, scrubbed, measured and returned to the field. The enriched oil is then conducted to Braun type heat exchangers, then to two preheaters in series of the same type of manufacture, to be finally distilled of its gasoline vapors in a Boner and Shelden stripper, or still. Details of this equipment and the operation will be discussed later. The gasoline vapors are then introduced into the bottom of the Boner and Sheldon dephlegmator where they are fractionated to end point specifications.

Temperature Unusual

The operation of dephlegmator is a bit diffreent in that the fractionation is carried out at unusual temperatures, being in this instance 260 degrees F. This temperature on the dephlegmator is held under constant control by the simple installation of a Foxboro automatic record controller instruments which, in its operation, causes certain vaves to open or close when necessary, which in turn permits the introduction of cold gasoline into the top of the dephlegmator whenever the temperature tends to or does increase. A small motor driven pump running continuously circulates the gasoline, either over the tower, or around through a closed system when tower conditions do not require recycling of the cooling medium.

The vapors leaving the dephlegmator are conducted to Braun type coolers and condensers; the condensate being gathered in gas tight, cork insulated, steel tankage. The lean oil leaving the stripper is handled in the usual manner, being partially cooled in the heat exchanger procedure and finally cooled in water sprayed coils before returning to the absorption towers. This briefly describes the circuits of gas, lean and fat oil, and vapors, but omitting the pumping and distillation methods entirely for later discussion.

Improvement Program

Some time ago the president of the company, O. C. Fields, and the superintendent, K. G. Stienbeck, decided that certain improvements in plant efficiencies were possible along the lines of fuel consumption and steam costs, and under their direction the engineering department undertook a series of tests and experiments with the end in view of reducing both fuel and steam costs

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ticular question is given serious thought, it will be seen to be the most important of all the considerations that apply to the use of motalin in the internal combustion engine. In fact upon the solution of this problem will depend the entire success of this fuel, for it is manifestly impossible to use it if the oiling system will clog up due to the iron oxide absorbed by the oil.

Just one or two figures will illustrate the seriousness of this matter. Assuming that the iron oxide is absorbed and that only five per cent of the oxide is disposed of in this way, that is fifty grams per thousand liters of gasoline, which means about 5000 kilometers of travel, it has been stated that the oil contains two to five grams of iron oxide per liter. The question is what has become of the other forty grams. Then again it must be remembered that the lubricating oil becomes contaminated with other impurities in its use and iron oxide just aggravates the conditions. The least serious disadvantage involved would therefore be more frequent changing of the oil.

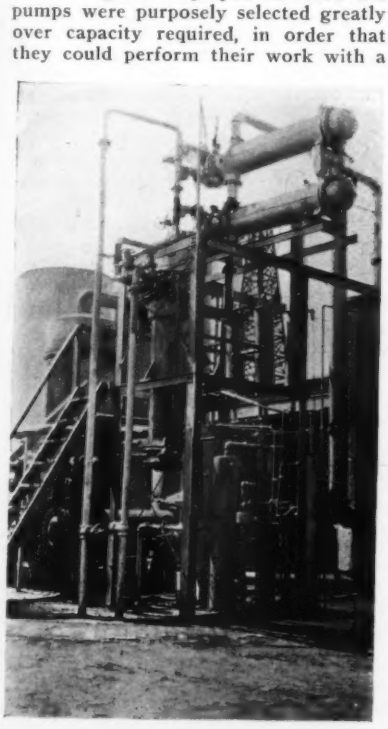
and volume of steam used. In other words the generally accepted statement that absorption gasoline plants may be considered fairly efficient in operation where one pound of agitation steam is utilized in the production of one pound of gasoline was not acceptable to the organization as fact; and they consequently began investigation and experimentation toward the reduction of fuel costs for agitation as well as over all fuel consumption.

An exhaustive study was made by the engineers of the conditions effecting fuel consumption and while no radical departures were made from ordinary plant practices, as practically all of the known devices for fuel economy had been pioneered by other operating companies, still, no expense was consideder too great if such expenditure provided or effected a saving in fuel.

Rotary Pumps Adopted

One of the changes in working equipment had to do with the subtsitution of rotary pumps, steam driven, for the duplex pumps employed in circulating the lean and fat oils. This installation consists of two Kinney rotary pumps—10 inch by 5 inch, which are used in the circulation of the fat and lean absorption oil to the absorbers and strippers. These pumps are driven by Troy steam engines, size 9 inch by 10 inch—and governor controlled. It was found that the water rate for the duplex pumps was approximately 225 pounds per horse power hour and this figure was cut to 50 pounds per horse power hour by the installation of the new type pump.

The engines employed to drive the pumps were purposely selected greatly over capacity required, in order that they could perform their work with a high exhaust pressure. This steam derived from the exhaust of the engines is utilized partly to agitate the oil-gas mixture in the stripper or still, thus assisting in the distillation procedure. The resultant surplus exhaust steam is made to do useful work by introducing it into an additional low pressure preheater which was placed in series with, and in front of, the live steam preheater. An increase of 50 degrees Fahrenheit in the temperature of the oil entering the live steam preheater is securd in thies manner, thus utilizing all of the exhaust steam.



Distillation, dephlegmation and condensing equipment of compact design

In the matter of still, or stripper, equipment, the company performed some unusual work in that they actually tested 6 types of strippers on their own plant in their efforts to determine the type of equipment most suited to their peculiar needs. The fact that the 6 separate stills were employed over a period of six months, changing this equipment over from one design to another without shutting down the plant speaks well for the engineers in charge. Stripper design was studied during this time with the end in view of saving of agitation steam without sacrificing stripping of the ltan oil. Six designs of stills, or strippers, were employed in the test, each one proving slightly better than those preceding.

It was found that the amount of steam necessary to commercially denude the absorption oil of its gasoline was dependent largely on the pressure carried in the stripper. Due to insufficient condensing and fractionating capacity it was not considered advisable to reduce the pressure in the stripper below 30 pounds per square inch, gage and all tests were made at this pressure. The stripper selected, as previously mentioned, was that of Boner and Shelden, which effected a reduction of the lean oil to 0.8 per cent, using under 1000 pounds per hour of steam for agitation, etc. There are no indirect steam coils employed in the stripper.

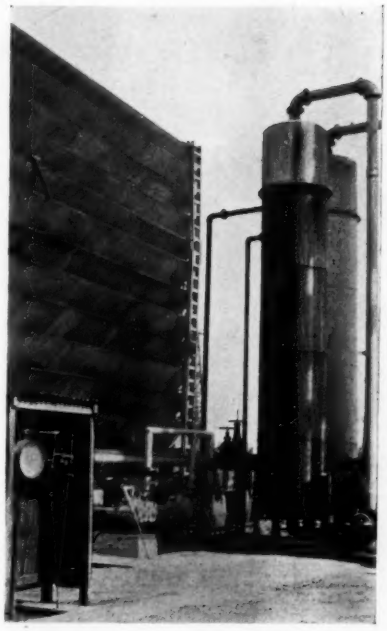
Fuel Regulated

Among other conditions studied and improved in the plant operations was the boiler settings, burners, and boiler feed conditions.

An important saving in fuel consumed was accomplished here as a result of the investigation. The plant uses its own design of low pressure pipe burners in which the orifices and ai rintake are carefully regulated. A Braun D-60 feed water heater was installed on the boiler water intake line utilizing the exhaust steam from the boiler feed pumps as the medium for preheating the water.

All hot water from traps and separators is recovered and introduced into the boiler feed water storage.

As the result of the careful campaign of improvement the strippers is now consuming steam at the rate of 1000 pounds per hour, or 234,000 pounds per day. The production of gasoline at approximately 10,500 gallons per day is expressed in weight at approximately 70,000 pounds daily. Thus the total pounds of fluid produced per day is 24,000 plus 70,000 or 94,000 pounds of fluid, or approximately 25.6 per cent steam to total fluid produced by weight. Instead of one pound of steam per pound of gasoline the proportion is about one-fourth pound of steam per pound of gasoline.



Absorption towers, handling 4,500,000 cubic feet of gas daily in natural gasoline plant of the O. C. Fields Gasoline Company, Huntington Beach, California

As to over-all gas used in the plant for fuel requirements and losses due to gasoline shrinkage upon completion of the work as outlined in the foregoing discussion, was found to be, over and average of one week, 19.8 per cent of the total wet gas received from the field. During this week the plant made an extraction from the natural gas of 2.7 gallons per thousand cubic feet of approximately 80 degrees A. P. I. gasoline.

Comparing these figures with the charts published by the Association of Natural Gasoline Manufacturers it is seen that the comparison is very favorable for the plant; since 32 per cent of the total wte gas received is allowed in the curves for the volume necessary for extraction of gasoline and plant use. There are a number of explanations or reasons for this:

First—Less horst power is used to compress the gas in absorption pressure, the gas being compressed in the plant under 20 pounds per square inch.

Second—The gravity of tht gasoline is less than is ordinary in plants usually treating such wet gas.

Third—The steam is made to perform all of its work in both pumping the oil and in agitation of the oil in the strippers.

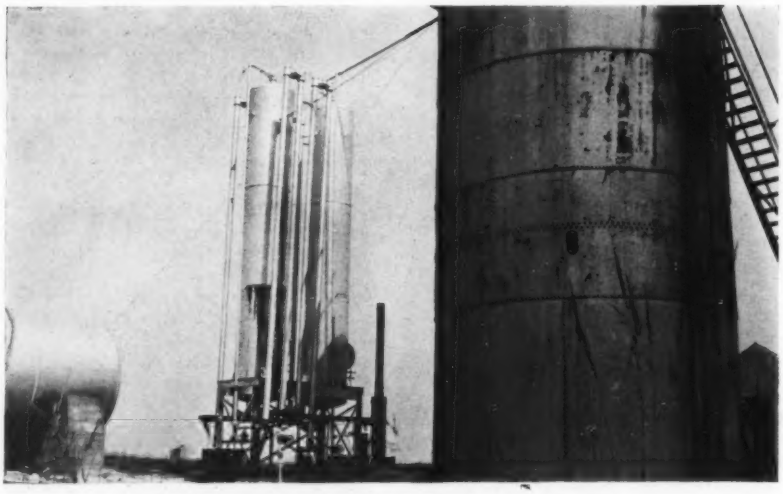
Electricity is purchased on the outside for power purposes in the circulation of water for cooling.

Ingenious Construction Gives Ringling Plant High Yield

Steam boilers serve as crude stills. Towers equipped with sterling coils

By Ralph E. Goode

THE Ringling Refinery of Ringling, Oklahoma is one of the small plants in the mid-continent territory but in proportion to size is taking as large a per cent and larger of gasoline from the crude charged than most plants of much greater size. The plant was built during the boom days of the Healdton oil field, largely of local capital but is now owned by the Gilmer Corporation of 60 Broadway, New York City. The refinery's charging capacity is 2000 barrels of crude per day but is running at present an average of 1600 barrels per day of 30.0 gravity, Healdton crude. The plant is situated a mile east of Ringling, founded by Jake Hamon and John Ringling of oil and circus fame. It is located near the tracks of the railroad built out of Ardmore by them and the shipping facilities are unhampered.



Continuous and batch agitators with horizontal acid tank

Plant Equipment

The plant consists of four 125 barrel capacity crude stills, two heat exchangers, one a one way and the other a two way exchanger; one 40 feet and one 30 feet, insulated bubble towers and two 30 foot uninsulated towers; a universial tube still of 250 barrel capacity line charge, constructed under the plans of the superintendent, G. A. Sonacker; the necessary receiver house and storage facilities; one 500 barrel agitator for treating the gasoline and two 45 barrel continuous agitators for treating the kerosene.

The continuous agitators were designed by the superintendent and are equipped to handle 250 barrels an hour. The acid tank is a horizontal tank of 5000 gallons capacity and lies in close to the continuous agitators. The caustic tank is also of 5000 gallons capacity and is placed perpendicularly at a convenient distance to the agitators. The treating materials are housed in a small building of fireproof construction. The power plant consists of two 125 horsepower shell boilers either one furnishing sufficient steam power to operate the plant operating at 100 pounds pressure. The source of the boiler feed water supply is two deep wells on the refinery grounds. They are pumped as producing oil wells are on the beam with oil rig apparatus and oil well engines. The water is well suited to steam making with very little scale forming compounds present and shut-downs dut to scale are very infrequent.

Heat Exchangers. One and two way

Stills Once Boilers

The equipment of the plant is perhaps unique in the refining industry. The crude stills were not designed originally for the business of refining crude petroleum but saw service in the beginning as steam boilers. However they serve excellently at present the service they are put to and a casual inspection would not disclose any irregularity in their make-up as crude stills.

The towers are an engineering feature in themselves equipped with bubble plates of special design, the bubble plates reach very near the top and at this point the tower is fitted with Sterling coils. Almost any grade of gasoline and kerosene can be made over them. The condenser boxes are large and fitted with Sterling coils and the water in them hardly ever reaches a temperature far above atmospheric.

The tube still is constructed of four inch steel tubes 20 feet long equipped with regular header construction. The gasoline is made off the tube still and No. 1, crude still. The tube still taking the first cut of gasoline and No. 1, crude still the second. There is a small separator between them, the light vapors from the tube still passing through this to the tower and the heavier residue going to the crude still for a heavier cut.

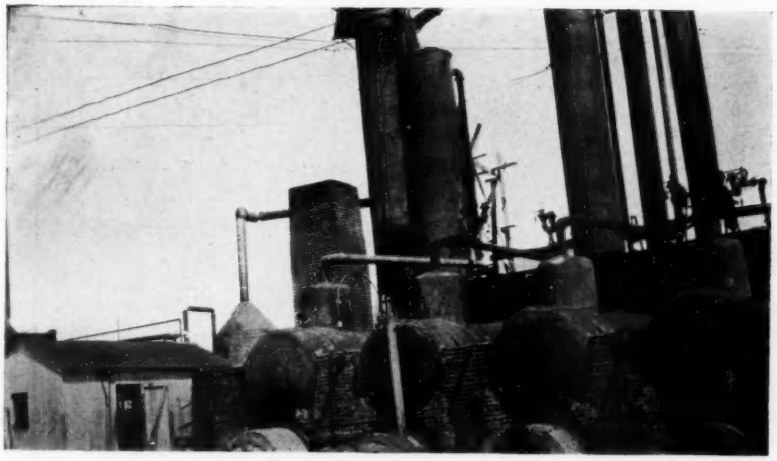
Refinery Cuts

From the 30.0 gravity crude some of which has been in storage for three years, a 22 pr cent cut of 53.0 gravity, 136 IBP

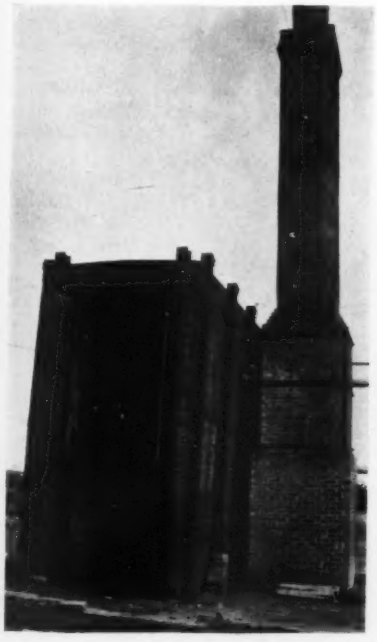
400 EP gasoline is being obtained of the tube still and No. 1, crude still. No. 2 crude still's product is used as a reflux and is sprayed over No. 1, tower about halfway up. Eight per cent of kerosene is taken off No. 3, crude still with a gravity of 410, IBP: 496 EP: 600. The color of the kerosene coming over is approximately 21 Saybolt before treating. Twenty-two per cent of 32.0 gravity, gas-oil is taken off No. 4, crude still with a pour point around 10 degrees. Fuel oil bottoms of 46 per cent are recovered with a pour point at zero with the gravity at 16.0. There is a total recovery of 52 per cent of refined products and 46 per cent of fuel oil bottoms, with two per cent loss.

The plant is using an absorption gasoline in blending the product of gasoline and the company has a contract with an eastern concern to take all of the gasoline made. The kerosene is treated to plus 25 Saybolt color and is an unusually good product having a long burning test with practically no objectionable features. The gas-oil finds a ready outlet to the larger refineries at Ardmore for cracking purposes and the fuel oil finds a ready sale to the railroads. The plant is one of the town's chief assets and the employees all make their homes there. The laboratory is small but well equipped and the young man in charge is well able to handle his work. Distillation tests are run frequently, with other work necessary to a refinery such as cold tests, sulphur tests, doctor and corrosion tests and at times experimental work of different kinds. The sulphur content of the Healdton crude is large, showing about one per cent and care in treating the plant's products to eliminate this objectionable compound is necessary. About six pounds of acid is used in treating the keosene free of this matter with approximately 10 per cent doctor solution.

The gasoline however gives very little trouble in treating and meets all Government specifications as to color, corrosion, acid and other points. The gasoline having a ready market does not stay in storage long and consequently there is small vapor loss. The storage tanks having vapor roofs also allow for little of this. The office of the refinery is a neat little building and the records of the plant's operation are kept filed in a convenient manner.



Crude stills and towers



Tube stills with stack

California Manufacturers Meet in September

Los Angeles, California.—"Recording Instruments," "Cooling Oils" and "Fire Hazards in Natural Gasoline Plant" were papers featuring the September 23 meeting of the California Natural Gasoline Association attended by 124 members and others interested in the various phases of natural gasoline manufacturing. The interest manifested at the meeting together with the large attendance represents the progress made by the association which was organized seven months ago with 50 members.

"Recording Instruments," a paper read by M. O. Jensen of the Jensen Instrument Company, created considerable interest resulting chiefly from discussions for and against the advantages of mechanical types against the electric types. Gauges, thermometers, control instruments for both pressure and temperature were all given their turn in the interchange of views following the delivery of the paper.

"Cooling Oils," a paper delivered by E. R. Cox, chief engineer of the California Petroleum Corporation, resulted in much discussion relative to the influence of velocity of oil through coils and on temperature exchange of coils.

The paper dealing with fire hazards in the natural gasoline plant prepared and read by L. V. Cassady, superintendent for the Lomita Gasoline Company covered many interesting points not to be overlooked in fire prevention work and winding up with the statement that the safety of the plant depended almost entirely upon the proper education of the individual employee. In the discussion that followed B. F. Masten of the Standard Gasoline Company related some interesting experiences and tests recently conducted by himself employing 30 mesh screen, brass, set in front of their boilers and working on the principle of the miner's lamp, which has proven very valuable as a preventative measure in eliminating the fire hazard arising from boilers employed to generate steam on the gasoline plant yard.

Paul D. Barton, president of the association and presiding officer, announced the following as chairmen of the various committees—

Standardization of Tests — R. W. Garman, Union Oil Company.

Safety and Fire Protection—H. L. Eggleston, Pan-American Western Petroleum Company.

One of the refinery's feed water wells pumped on the beam

How Shall Refiner Responsibility and Management Be Distributed?

By H. L. Kauffman,
Denver, Colorado

ONE of the foremost questions in the mind of the president of any organization is, "How shall I distribute authority and responsibility in the company so as to have a smooth-working organization functioning at a maximum efficiency at all times?" Just how successful a president of a company is in obtaining the desired results by proper distribution of responsibility is an indication of how successful that man is as an executive.

In the management of a corporation engaged in all phases of the petroleum industry, responsibility must be given to subordinates for obtaining the raw material (in this case, the production of crude oil); for storing and transporting the raw material (crude petroleum); for refining the crude oil into finished, marketable petroleum products; and, finally, for distributing and selling those finished products so that they reach the ultimate consumer. In addition to what has been mentioned, the president, also, must distribute responsibility relating to the financial phases of the business, such as the auditing of the books, etc.

This article will deal mainly with the distribution of responsibility in refinery organizations, mention being made of the actual methods followed by at least two different companies in dividing up the responsibility for the operation of the refinery. This discussion will be made—not with the idea that the methods that will be given for distributing authority are the best methods to be followed in obtaining a smooth-working, efficient organization; but with the thought that there will be contained therein small points or ideas that will be suggestive to the executive as to how the difficulties that are encountered by him in his present method of distributing responsibility may be "ironed out."

Before entering into a detailed discussion of this subject, however, it may be of advantage to cover the subject of refinery organization in a general way, setting forth what the responsibilities and duties of the various executives usually are in organizations of different size.

Methods Vary

As A. D. Smith, in Volume II of Day's "Handbook of the Petroleum Industry," pages 319-22, covers this subject very comphehensively, his comments on the subject of general management of refineries will be quoted in full:

"In the operation of refineries there is considerable variation as to the methods employed, these obviously depending on the size of the plant and on the general business policy. Almost invariably a corporation form of control is chosen, although small skimming plants are often practically owned by one man who exercises the functions of president, sales manager and superintendent. In plants of slightly larger size, or where a president has been elected as an expression of stock control, active management often devolves on a vice-president. The latter frequently serves as sales manager and secretary, being aided by one or two office assistants and a superintendent in charge of the plant proper. In small plants, where there are many diversified sales and considerable office correspondence, the president (or vice-president where the former is inactive) usually functions as general manager, handling the sales direct, and overseeing the refining policy in a general way. The details of the refining are entrusted to a superintendent. Correspondence of a general nature, purchasing of supplies, credits and collections are handled by an elected secretary, who also serves as treasurer, in plants of this class. Such a form of organization also includes an appointed sales manager and an elected treasurer where development of businses warrants such a course, this arrangement being typical for the average moderate sized plant. In the majority of refineries of this nature, which are essentially one or two-man institutions, the directors are mostly officers of the company. The board, as such, generally exercises little action other than to conform with the legal requirements of the corporation's franchise. The authority lies with the president (or vice-president) and general manager Organization on this order is illustrated in tabular form in Figure I.

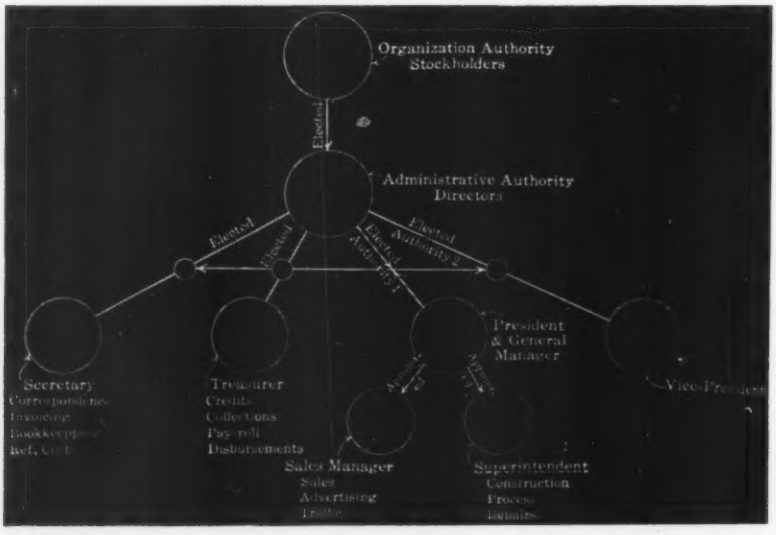


Figure 1—Small refinery management

Control Over Plants

"In the next higher stage of development, the directors usually exert a considerable voice in the affairs of the company, although the president, vice-president, secretary and treasurer may be sufficiently heavy stockholders, as is frequently the case, to control their election and direct the general policy. Matters of moment, however, are decided by board action, and authority in general is more delegated as the size of the plant increases or the sales policy expands. When the general or sales officers are located at a distance from the refinery, or where the company operates more than one plant, a general superintendent is usually appointed, who exercises control over the local plant superintendents in all matters pertaining to process and construction, he being himself responsible to the general manager of the organization. In a still larger scale of operations, authority in all matters pertaining to plant control is often vested in a refinery manager, especially when the plant is remote from the general offices. This official is often responsible for the crude supply, as well as for the quality of the finished products, refining costs and general plant upkeep.

He is usually aided by a superintendent in direct charge of process and plant labor. The chief clerk is in charge of costs, statistics and local office force. The purchasing of supplies is often a function of the refinery manager and a certain responsibility for car records is demanded from his office, but the traffic manager himself is always located in the general or sales offices, and is responsible only to the sales manager. As the extent of operations increases, or where the president has many executive duties, the refinery manager is usually responsible to an officer of the corporation with the title of "vice-president in charge of refining." A vice-president in charge of sales exercises equal authority in matters pertaining to his department. In the very large corporations there is often a manufacturing board, formed of the various managers and technical heads with a vice president of the company as chairman. Such a group passes on refining costs, new processes and products, and matters of like nature.

"Authority within a plant itself, of the type now under discussion, is usually delegated, as recently stated, to a superintendent and chief clerk. The former is aided by an assistant superintendent in charge of process and labor, a chemist responsible for process control only, and a master mechanic or mechanical superintendent in charge of repairs and construction. The several foremen or department heads, such as still foreman, wax plant foreman, head treater, etc., report to the assistant superintendent, while the engineers and shop foreman, head boiler maker, head machinist, boss pipefitter, etc., report to the mechanical superintendent.

"Figure 2 gives a comprehensive idea of the management of a large refinery, delegated through the various officers of the corporation and their appointive heads, the scope of authority within the plant itself being shown in some detail.

"In a plant organized as above, the refinery manager generally establishes the wage schedule for the works, labor and clerical force, while the superintendent and chief clerk determine the actual number of men required to operate their departments. The number of employes in different plants of the same crude capacity will vary widely, according to the nature of the crude, the process employed, the layout and physical condition of the plant, the amount of operating and construction cost data required by the general office, to say nothing of the personal efficiency equation of the men in charge. While it is obvious that no fixed rule can be given in such matters, recent developments in the petroleum industry have demonstrated that considerably reduced forces both in plant and office have increased rather than decreased the general plant efficiency.

Too Much System

"Because a large plant needs an assistant superintendent to look after the process and a mechanical superintendent for construction and repairs, it does not follow that such organization is necessary for a plant of moderate size where the department foremen may profitably report directly to the superintendent. Without in any way reflecting on the high-class research carried out in many of the larger plants, it may be stated that a painstaking, accurate tester will frequently serve a plant of moderate size with more efficiency than the so-called research often practiced, which in reality is very frequently the rediscovery by a technically trained man of facts well-known to the experienced refiner. Again, a large clerical force employed in collecting and compiling data of refining costs and other statistical information, more or less ignored in the sales campaigns, add little real efficiency to plant operation; and while no one will gainsay the importance of accurate cost and yield data, there is such a thing as over-systematization. In times of profit these features are apt to pass unnoticed, but they are the first points of attack in periods of depression. The ideally operated plant is that which runs with a minimum number of employes, where costs can be determined beforehand with sufficient accuracy and the process possesses such a degree of flexibility that no large quantities of unsalable or profitless products will accumulate. Such a condition obviously requires a well laid-out and well kept-up plant, as well as an exceedingly close relation between operating and sales departments."

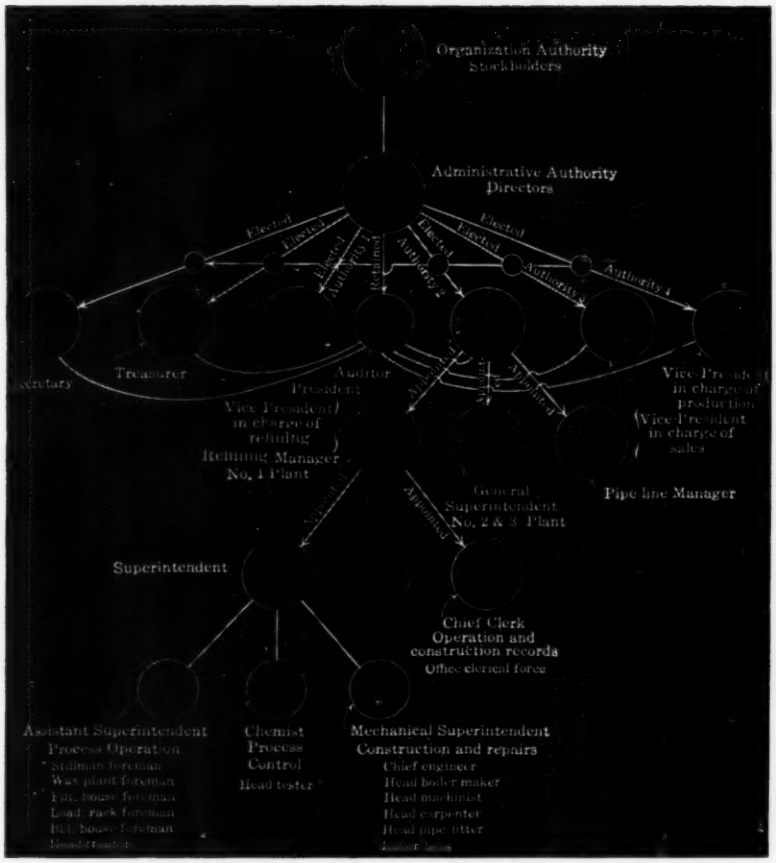


Figure 2—Large refinery management

Fig. 3 shows a method in use for a number of years by one large organization, having complete refining and marketing facilities (but little or no pipe line and production departments) for distributing responsibility in their refinery division.

It is noted from a study of this flow chart that here, too, there is a vice-president (A) in charge of refinery operations. Co-operating with him for the best interests of the company are the heads of the pipe line and producing departments and of the marketing department.

Information

Working directly with the vice-president of refineries is a man who is given the title of "Head of the Refinery Information Bureau" (B). This man, in reality an assistant to the vice-president in his work, must have at his command at all times full information relating to present refinery operating methods, stocks on hand at refineries, present condition of refinery equipment, progress of any new construction work at any of the refineries, and

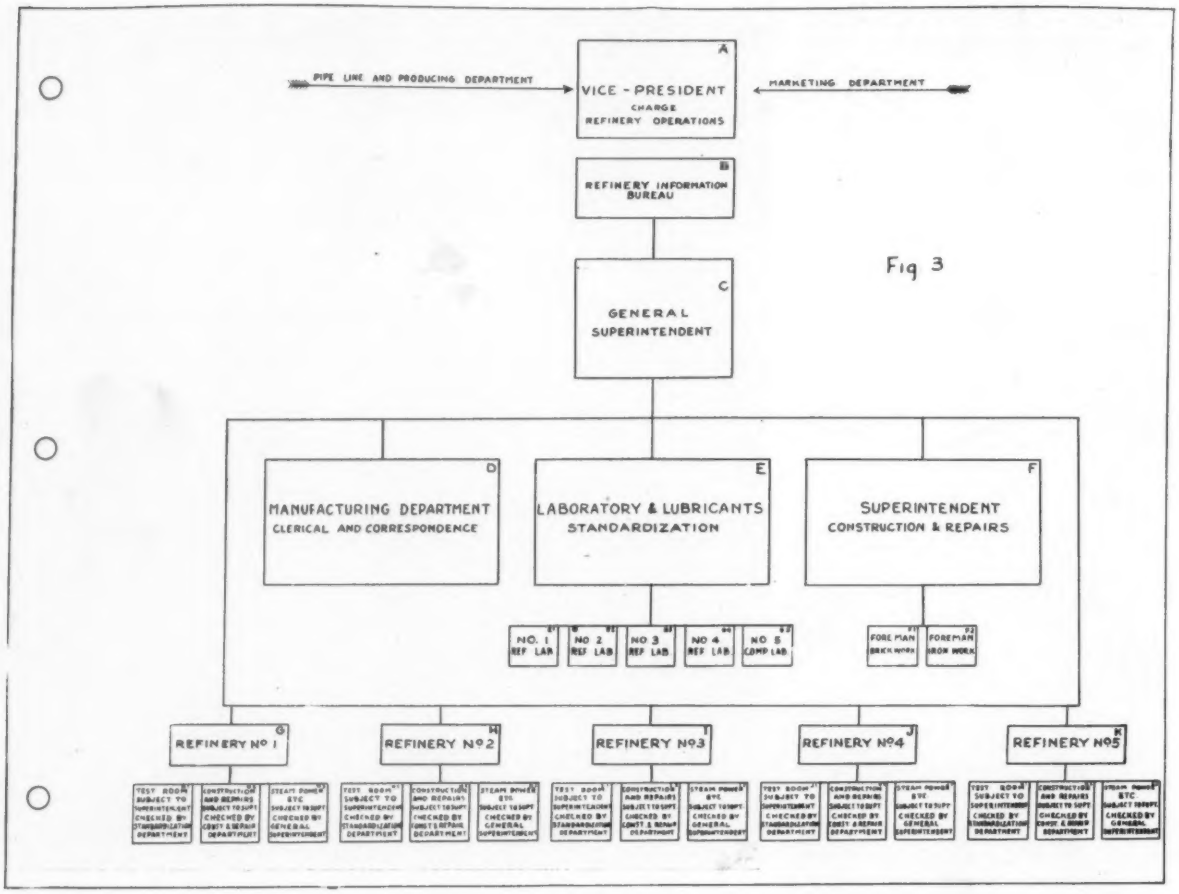


Fig 3

Figure 3

all other similarly-related information. Usually, the person holding this position is a technical graduate—most often a chemist or chemical engineer, who, after years of refinery experience, has been advanced to this important position. In many organizations, the man thus keeping actively in touch with refinery conditions is given the title of Technical Advisor, Technical Director, Consulting Chemist, or any similar names indicating the capacity in which such a person is employed by the company. Regardless of the tilte, the man holding this position at all times is an active member of that particular board or committee that deals directly with all refinery manufacturing problems.

The organization, whose method of distributing responsibility in their refinery division is here being discussed, operates five different plants located at various points in North America. Directly in charge of refining, and hence directly responsible to the vice-president in charge of refinery operations, is a "General Superintendent of Refineries" (C). In some organizations this position is called "Refinery Manager." The general superintendent may look after, in a general way, the operations of the five refineries under his control, or—and this is a change that actually took place when economy demanded—he may be located at the largest refinery of the company and actively direct the operations of that refinery (as a refinery superintendent) in addition to being general superintendent of the operations of the four other refineries—at each of which is located a refinery superintendent who is responsible to the general superintendent.

Divided Responsibilities

The general superintendent sub-divides his responsibility to a chief clerk in charge of the clerical and correspondence work of the manufacturing department (D); to a chief chemist, who is supervisor of the control, research and experimental work as conducted at all five refineries under the direction of a refinery chemist—this chief chemist (E) also being in charge of the standardization of lubricants (Standardization Department) and acting in a technical advisory capacity both to the general superintendent and to the vice-president in charge of refining; and to a mechanical superintendent or chief engineer who is in charge of the engineering department of the company, and hence, as such, is directly in charge of all new construction work and important repair work at all refineries (F).

The office force of the chief clerk handles cost and yield accounting work as it relates to all refineries; correspondence relating to the manufacturing department; auditing of books and "keeping straight" all financial matters relating to refinery operations; and similar duties. The duties and responsibilities of the chief chemist and of the mechanical superintendent or chief engineer have already been outlined.

Resident Engineer

Concerning the functioning of the mechanical department, it might be mentioned that at each of the larger refineries of this company is loacted also a so-called "Resident Engineer." This engineer is responsible, first, to the Refinery Superintendent and has direct charge of all repair and maintenance work at that particular refinery. On repair work or new construction work of small cost, or work of such a nautre that it either must be done immediately or the successful operation of the refinery will suffer, the resident engineer may get such work done without the approval of the chief engineer; on work other than that mentioned, however, same is subject to the approval of the general superintendent, after which it is checked—

(Continued on page 56.)

National Petroleum Association Enjoys Prosperous Year

Tenor of Atlantic City meeting is that industry is swinging back to normal conditions

By Roye C. Munsell
Staff Representative

Atlantic City, N. J.—Better economic conditions now obtain in the petroleum industry, according to the opinion expressed by Fayette B. Dow, at the annual meeting of the National Petroleum Association held at Atlantic City, N. J., September 15, 16, 17.

Mr. Dow, in addressing the meeting, said in part: "Our members in common with the industry as a whole have been passing through a very difficult economic period. In four consecutive summers at the height of seasonal consumption gasoline prices were badly broken. Crude oil production exceeded requirements. Too much gasoline was manufactured, stocks were too large. In this situation competition for markets inevitably brought lower prices. In consequence financial results of operation were very unsatisfactory, for the large as well as the small units in the industry.

Consumption Ahead

"This year somewhat better conditions have prevailed. An examination of the Bureau of Mines' figures shows that for the twelve months ended June 30, 1926, the consumption of petroleum and its products exceeded production and imports by 17,015,000 barrels, or a daily average of 46,616 barrels.

"There have been advances in gasoline prices in 1926 (now the subject of an investigation by the Federal Trade Commission) but these advances amounted to a recovery no greater than the decline of those prices in 1925. Prices are still under the restraint of large stocks of crude in storage. Gasoline stocks in relation to consumption are less than in recent years. On June 30, 1926, at the rate of June consumption, there was 46 days' supply, as compared with 62 days in 1925 and 63 days in 1924. The tendency for the past year has been clearly in the direction of stabilization, but the experience of the industry in recent years shows that the relation of supply to demand can be quickly thrown out of balance.

"The production of too much crude or the refining of too much crude means lower prices and inventory losses. No company or group of companies is powerful enough, nor by any conceivable combination could be powerful enough, to prevent the working of that economic law.

"Throughout the industry generally no change in practice is perhaps more noteworthy than what has been described as 'hand-to-mouth' buying. Orders are being placed for reasonably immediate rather than remote requirements, manufacturers are making what is ordered and not piling up stocks against anticipated demands. The result is a more even flow from raw materials to consumption, steadier plant operation, less speculation and less depression of prices from competition of accumulated stocks. In the oil industry, consumption requirements have been greatly increased. Notwithstanding the seasonal character of the petroleum demand, stocks of finished products have been and are larger than necessary. While there has been an improvement in this respect, it is reasonable to believe that further study of the cost of carrying stocks and their market influences will bring manufacturing output closer to current consumption. If the trend toward stabilization continues the financial results of operation should become more adequate and satisfactory than they have been in recent years. For the refineries with relative small output it would seem that there must be an unceasing effort to reduce costs of manufacture. Too keen competition for market outlets has made costs of distribution excessive. There are many marketing practices which are uneconomic and therefore indefensible from the standpoint of good business. No law stands in the way of a frank discussion of these conditions and we believe that a useful service in that direction is open to our department of Trade and Commerce."

O. P. KEENEY
Re-elected president of the National Petroleum Association

Officials Re-elected

Mr. Dow was chosen by the association to serve its members as general counsel. At the annual election of officers, O. P. Keeney was re-elected president, and P. S. Tarbox and H. A. Logan were chosen as first vice-president and second vice-president, respectively. Willis Sane will continue as traffic attorney, Herbert G. Eaton as recording secretary and G. B. Hunter as treasurer. The board of nine trustees to serve for the coming year is composed of Fred G. Clark, Sheldon Clark, Frank B. Fretter, A. W. Scott, H. A. Logan, E. M. Lyons, O. P. Keeney, T. J. Hilliard, B. B. Stroud, P. S. Tarbox, H. H. Green, and R. A. Wotowitch.

Judge C. D. Chamberlin, of the law firm of Chamberlin and Fuller, Cleveland, whom the association has been very fortunate to have as their general counsel for some twenty years will

PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

continue active with the group in an advisary capacity.

Judge Chamberlin's association with the N. P. A. dates almost from the very beginning of the organization and during all these years he has been giving it exceedingly wise counsel and fought its legal battles on any front which the occasion demanded.

At the Atlantic City meeting this year, Judge Chamberlin told the younger members of the association, and recalled with the older members, something of the N. P. A. as it was 20 years ago, when he became associated with it, and traced eventful life down to the present.

Of course, a great change has been wrought in the character of the association since its beginning, which was really way back in 1902.

According to an official statement, which is interesting, the original purpose of the organization was by "mutual effort to cope with unfair trade practices, predatory competition and secret rebates."

Broad Field

The particular conditions which obtained during that period are now very largely a matter of history, but the spirit of co-operation in which they were dealt with by the N. P. A. has grown and increased in scope from year until the assocation is outstanding for its broad field of industrial activity which is being carried on by associated endeavor.

O. P. Keeney, president of the association, in his address before that body at its annual meeting this year on "Products and By-Products of Association Work," named the following "products" of the N. P. A.: reduced operation costs, legitimately improved marketing conditions, information and assistance on traffic matters, the solution of knotty legal and tax problems; wiser interpretation of vitally importana trade statistics, preventing unnecessary fire losses, both of property and life; increasing earnings through more intelligent supervision of operations by improved cost and general accounting methods; the avoidance of unnecessary and unpleasant disputes with customers in regard to quality of products; the improvement of the attitude of the public toward our industry; legitimate efforts against unfair legislation; provision of a readily accessible forum for the discussion of mutual problems; the acquisition of new ideas from inspection visits to other refineries; the gaining of helpful technical knowledge by inter-laboratory visits; uniformity in testing methods and the establishment of better standards and specifications; interchange of credit information; welfare work for employees; pension plans and accident prevention.

Department Work

All of these "products" are now available to the members of the association. In this connection, it is interesting to note that the work which "turns" out these products is not being done by a large employed staff, as one might suppose, but rather by member-activity, and at a surprisingly small cost. The annual expense of the association to each member is much less than that of an office boy, it has been said.

The work of the association in this respect is departmentalized with a trustee in charge of each department. At present the N. P. A. has eight de-

(Continued on page 79)

Modern Stills

WE have just spent a great deal of time and energy during the past few months in an effort to improve conditions in our boiler houses. The net return of this effort is expressed in one measure only, that of the coal pile. I want to take a few minutes of your time in drawing attention to another department of your refineries where there is a field of even more promise. I refer to your stills. Here, not only is there an opportunity to save fuel but increased yield, greater throughput and better quality of products all offer promise of more profits.

To visualize this field let us briefly review the progress made by the industry since the early days. The first stills were small cast iron or steel kettles with a condenser worm in a wooden tank. The kettles were charged, fires lighted and the products separated at the condenser outlet. The industry outgrew these small kettles and the cheese box still was evolved, really the kettle on a bigger scale. The short travel of flue gases was a recognized disadvantage so that the horizontal cylindrical still was a natural outcome. This still gave more flue gas travel and heating surface per barrel and was a safer piece of equipment.

The oil was, however still batched down and cuts were managed in the same old way. About 1900 some of the larger companies started running this type of stills continuously. Six, eight or more stills were connected together and the oil was pumped through in series. Each still carried a progressively higher temperature and the streams from each were of constant specification. This was a decided step forward as it gave an opportunity for heat exchange. The hot residual was used to heat the ingoing crude oil. By use of modern towers this type of installation will make very close cuts. Equipment may be installed to take the waste heat from the flue gases thus bringing the thermal efficiency up as high as 60 to 70 per cent.

About 1912 the first installations making use of waste vapor heat were tried in this country. The first equipment was adopted bodily from European practice, was clumsy and expensive. The idea being sound, development was rapid and we now have very satisfactory apparatus for this use.

Corrective Methods

When the California oil fields came in great difficulty was experienced from the high percentage of water in the crude. It was found that passing the oil through tubes at a temperature sufficient to evaporate the water and then putting it through an expansion chamber to allow water and evolved vapors to escape was a practical solution. Thus the pipe or tube still came into existence.

Now let us go back to the batch still, review its deficiencies and see where and how the modern continuous battery and pipe still correct them.

The batch still is inefficient from a fuel standpoint. It must be. We rarely find one over 25 per cent and usually they are between 15 and 20 per cent. Why? Two big reasons. First, the flue gas temperature must be 200 to 300 degrees above the oil temperatures. When running to stock this results in flue gas temperatures of 800 or 900 degrees. Then you do not dare run very high combustion chamber temperatures so you let in lots of excess air. Second, there is absolutely no chance for heat exchange. The bottoms must be pumped out quickly to make room for a new charge. Even if you did attempt to use some of the heat from the vapors into what would you put it?

The batch still is a very poor piece of fractionating equipment. You make many cuts and to get your finished products you re-run cuts galore. We often find that for every barrel of crude run two barrels of semi-refined cuts find their way back to the stills for rerunning. We term this 200 per cent re-run. All of this takes up still capacity and uses fuel, steam power and labor.

Now a lubricating plant cannot get away from some batch running of oils. When you want a test on a residual product it has to be batched down and for reducing neutrals, stripping naphtha from bright stock and similar uses the batch still has its place. We find that the Pennsylvania refiner should get along very nicely on 70 to 80 per cent re-running. In other words for every barrel of crude charged to his stills he will have to re-run .75 to .8 of a barrel of semi-

PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

refined oils. From the nature of the work this amount is practically unavoidable.

Very little can be done to improve conditions in the typical batch still. A better designated setting with plenty of combustion space will help some. Attention to air leaks will also aid. Avoidance of leaks at the points where still and brickwork touch is quite a problem. We now have expansion cushions that overcome this trouble to a large extent.

Longer flue gas travel is an aid. Some recent stills have been designed with return tubes like an H. R. T. boiler. Such practice cannot be applied to a still running to less than 50 per cent bottoms however so that the principle use of stills with internal flues is confined to continuous batteries.

Semi-Continuous Running

A method of operation holding considerable merit is the semi-continuous system. A still is charged with a small amount of oil anad started up. The oil being run is then fed into the still continuously through a vapor heat exchanger. This is continued until the still is full of oil to the desired test. It may then be pumped out or as is often done only a portion of the oil is withdrawn and the feed started again. This method presents a very good field for heat exchange which of course greatly improves the over all efficiency of the battery.

Let us see how the continuous battery meets these objections. First, there was the questionn of fuel efficiency. With a continuous battery we have a constant feed of crude oil entering the first still into which we can absorb the waste heat. Three sources of waste heat are available, the hot bottoms, the vapors and the hot flue gases. It will depend upon what products are being made, what source we turn to. If the stills are running to fuel oil or bottoms that can be taken continuously from the last still in sufficient quantities a large amount of heat may be picked up here with very simple apparatus. When running to cylinder stock or asphalt the last two or three stills are batched down to test in rotation so they have to be pumped out quickly and the opportunity of salvaging their contained heat is lost. Then we turn to vapor heat exchange. We can install exchangers on the vapor lines and pump our crude through them in series. The writer has in mind one battery that is feeding the first still crude oil at 350 degrees already topped of 25 per cent of the light ends all on the heat from the vapors. When it comes to the extraction of heat from the flue gases I find that economizers to heat boiler feed water or waste heat superheaters for the steam are preferable to trying to salvage the heat with the crude oil feed. The apparatus is standardized and the fire risk less.

When we come to the cuts to be made from a continuous battery we have certain advantages unsurpassed by any other type of installation. Each still gives a steam of constant quality and quantity. Our tower design is therefore greatly simplified. Many and varied are the types of towers. Fundamentally what is desired is contact between the evaporating liquid and vapors in a condition as nearly approaching equilibrium as possible. Two types stand out above all others, the packed tower and the bubble tower. If we could be sure of equal distribution of the descending liquid and ascending vapors over the cross section of a packed tower it would be ideal. This is nearly impossible of accomplishment and hence the bubble tower is generally recognized as the best today.

Do not be misled by the air cooled shells with various arrangement of trays, tortuous channels, etc. They are simple dephlegmators and have a decidedly limited application.

With proper towers our continuous battery will give complete separation of all light products up to and including 300 degree oil. In fact further final cuts could be made but when running Pennsylvania crude there is no object in manking final separation between fuel oil and wax distillate since the latter will have to be redistilled anyway.

Pressure distillate and filter wash may be distilled at the same time by pumping such products directly into the towers.

This description may have been of interest but it must be borne in mind that continuous stills have a limited application to a Pennsylvania refinery. In the first place 6 to 8 stills are necessary. The smallest practical size stills would have a capacity beyond your requirements. I would say that about 2000 barrels per day is the economical lower limit for a continuous battery. Of course it is possible to operate continuously part of the month and then change to batch running to finish up the stocks accumulated but this procedure does not yield the full advantages.

Pipe Stills

Let us turn our attention to the modern pipe stills. First let us get firmly in mind that there are two distinct types of pipe stills. First, the "once through" type and, second, the circulating type.

The first consist of a coil discharging to a separator. Towers and exchangers are supplementary and do not affect the principle. The oil is pumped through and raised to a temperature sufficient to evaporate all of the cuts desired. This oil and vapor are discharged together into a vessel known as a separator. The vapors leave the separator as one big cut and are fracionated by the towers to the products desired. Pipe stills are built in any size up to 10,000 barrels per day and for any desired percentage of overhead up to 90 per cent. Their efficiencies are excellent..

Counter flow of flue gas and oil result in high furnace efficiencies. With a simple residual exchanger 60 to 65 per cent efficiency is easily obtained, and I believe with complete vapor exchangers the overall efficiency of this kind of apparatus may be brought up to 80 per cent.

This once through type of heater has certain disadvantages for the Pennsylvania refiner. In the first place, the test on the residuum cannot be controlled with sufficient accuracy for running oil to cylinder stock or reducing any oil to a given specification.

True, a deeper cut could be made to insure reaching the desired flash or fire, but the sacrifice of yield would be serious.

Again a once through heater must be operated at a given minimum throughout.

Prevention of coke or salt deposits in the tubes is accomplished by the maintenance of a velocity in excess of the so-called critical velocity. This critical velocity is that at which the flow changes from streamline to turbulent. The flow must always be turbulent to prevent the deposits and hence the unit will have a definite minimum throughout.

The once through heater may be used to strip the crude of all light ends and even fuel oil, leaving the wax distillate cut to be taken off in a batch still when the reduced crude is run on down to stock. This type also has an application in the Pennsylvania field as a substitute for the first four or five stills of a continuous battery.

The circulating type of pipe still consists of a tank separator with a hot oil pump and a pipe heater. There is no heat applied to the separator. The pump draws the oil from the separator and puts it through the coil right back into the separator. The tubes being direct fired there is an increment of heat at each pass and the bulk of the oil in the separator gradually rises in temperature and distillation goes on progressively.

A moment's thought and it is apparent that this is in reality our old batch still with simply a new method of applying the heat. Thus, any of the operations conducted in a batch still can be carried on in the circulating type of pipe still.

Saving the Heat

This elementary circulating type of pipe still cannot in itself show any great amount of efficiency. There is no feed, therefore no chance of heat exchange. The flue gases at the end of the run must still be high in temperature.

Now if we take a second separator and put on vapor heat exchangers we can use this second one as an accumulator of heat while the first one is running. When the first one is down the second one will have a batch of oil at 300 to 350 degrees temperature and with 15 to 30 per cent of the overhead distillates already removed. The circulating pump and the pipe heater are then swung over into the second separator, the first one is pumped out and is then used as an accumulator while number two comes on down. Thus the separators alternate, while the circulating pump and pipe heater run continuously. In this way the small refiner can take advantage of the economies of pipe still distillation at the same time possessing a unit on which he can run to stock or reduce an oil to test. In passing let it be

(Continued on page 78)

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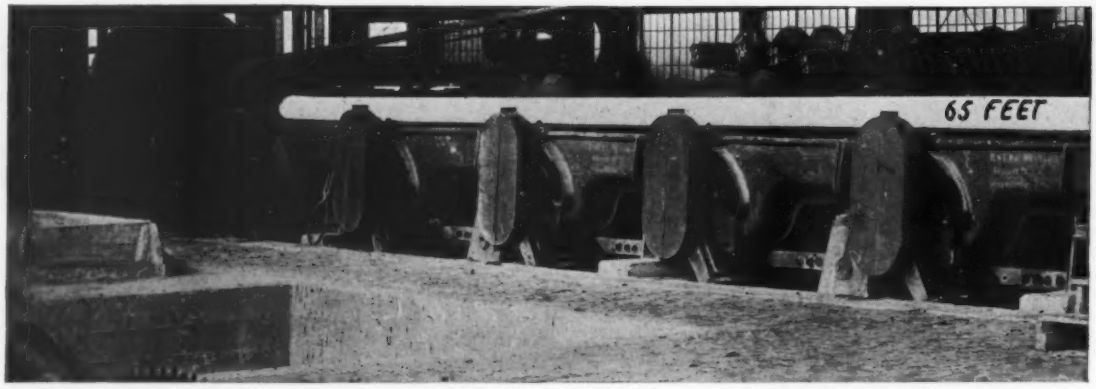


Marvelous New Pilger Mill in One Continuous Operation Manufactures Cast Ingots Into Finished Seamless Steel Tubes Up to 12 In. Diameter and 50 Ft. Lengths

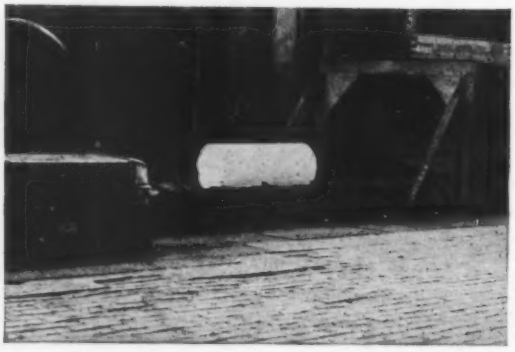
THE installation of this giant new Mannesman Pilger Mill was completed a few weeks ago, has been thoroughly tried out, and is now in full production. It was manufactured to our specifications and is housed in modern new buildings covering an area approximately 270 ft. x 800 ft. built expressly for it. Rarely is a complete mill unit completely designed and installed under such favorable conditions for quality and efficiency of production.

First Such Installation in America

It is the first seamless tube mill of its type and size to be installed and operated in an American plant. It is capable of turning out a tremendous tonnage of the finest quality seamless steel tubing in sizes ranging from six inches to 12 inches outside diameter, and in lengths up to fifty feet.

From Solid Ingot to Finished Tube

An extraordinary feature of this mill is that it successfully pierces a solid cast ingot, and in one continuous operation turns it out as a finished tube of large size. The ingots are all bottom cast, and the severe distortion to which a steel blank of this size is subjected in the piercing mill can be withstood only by the finest quality of steel. The rough hollow billet that comes from the piercing rolls therefore has passed a supreme test of its quality and soundness.



The round solid steel cast ingot leaving heating furnace for piercing mill

Pittsburgh Steel

Pittsburgh

NEW YORK
DETROIT
CHICAGO

CEMENT

Pilgering, a Forging Process

IN pilgering, the unfinished part of the hollow billet is repeatedly forced between the eccentric pilger rolls which seize, compress, and force the billet back. At operating speed this becomes hammer-blow action on the steel, the same as a forging hammer. The thick walled hollow billet about 8 feet long is thus pilgered (forged) into a tube of the desired wall thickness and in some cases, as in the above illustration, 65 feet long (before the ends are cropped).

Thus the superior quality steel which has passed its first test in the piercing operation is converted into a tube of the excellent texture that is a characteristic of pilgered steel. The pilgered tube now passes to a hot saw, the crop ends taken off, then to the sizing mill, cross rolls, and various cut-off and threading machines for the finishing operations. For certain finishes the pilgered tube is reheated and passes through a reeling machine before reaching the sizing mill.

A Boon to Oil Country Operators

These superior quality seamless steel tubes in large sizes and lengths for casing, drill pipe, etc., with their greater strength and elastic limit prove of wonderful advantage in oil country activities. Manufacturers in other industries also, are placing orders for material from this new mill. We have, of course, other seamless steel tube mills and manufacture boiler tubes, arch tubes, superheater flues, and tubing for automobile and other mechanical purposes. Your inquiries will be appreciated and our engineers will gladly give study to the possible application of "seamless" to your problems.

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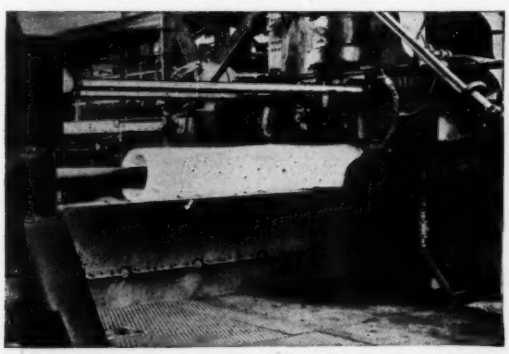


The rough hollow billet emerging from the piercing mill

PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

What I Have Learned From a Study of Nineteen Boiler Houses*

By Herbert A. Ross

YOU honored me at your meeting in April at Cambridge Springs by affording me an opportunity to address you relative to some of your boiler house problems. At that time, I was slightly acquainted with you and had been in only a few of your plants. Due to that fact, and owing to the short length of time afforded me, I was forced to deal in generalities to a considerable extent. Today, just six months have passed, you again honor me with a part in your proceedings.

During these six months, I have had an opportunity to view more of your plants and to become better acquainted with you. Opportunity has been affored me to collect data of a substantial character and to establish certain standards that have been of invaluable use for comparative purposes in my endeavor to establish economy in your boiler houses. Some of this data you are already familiar with; other information will be given you at the proper time and as opportunity affords.

It is my purpose, this morning, to use some of the facts and figures I have gathered, in order to inform you of what has been accomplished to date; to tell you of the possibility of saving within reach of each one of you, without a single exception, and finally to endeavor to prove to you the value of the engineering work you have undertaken as an association, in so far as it applies to your boiler room economy.

Before proceeding to do this, however, I want to take the time to here publicly express my gratitude to a number of you gentlemen for the assistance and encouragement you have given me when the "going" was a bit heavy. My appreciation of the loyalty you have exhibited in forwarding my work, the assistance, encouragement and confidence you have accorded me cannot be adequately expressed by mere words. The succes I have had would have been absolutely impossible of attainment without your cooperation, and I most earnestly crave a continuance of your favor and good will, so long as our association together in this work continues.

Saving Possible

When I stood before this association last spring, I made certain statements as to the saving in fuel I thought it was possible to secure by change of method, etc., in your boiler rooms. I did not, at that time, have a great amount of facts with which to reinforce my statements, and some of you gentlemen, I know, were somewhat skeptical. You will also recall that I confined myself principally to indicating to you the various places where loss could occur in a boiler house, and the methods by which these losses might be abated.

I stand before you this morning with a mass of figures based on facts and with a fund of information, gleaned from actual personal contact in your refineries, that should be of considerable money value to you. If you will heed the advice I extend to you, your investment in the service we have undertaken in your behalf will be returned to you manifold in the course of a year.

This work was started just about a year ago as an experiment, and is today an accomplished fact and far exceeds, in importance, the most sanguine hopes of its originators. When we started this campaign, we had nothing much with which to support our theories, nor had we any precedent whatever as a guide to our effort. We were therefore, compelled, by reason of these very conditions, to be exceedingly careful and conservative in the statements we made relative to the amount of saving we could assist you in securing. Now, in every case where the managements have gone to it and made the least attempt to follow our advice, loss has been changed to a profit, in greater amounts than we promised in our reports of survey. Mark you also, scarcely any money, other than what was invested for our service, has been spent.

Actual Saving

There are men present here, within the sound of my voice, who are today saving anywhere from $500.00 to $1,000.00 or more, per month in their cost of fuel. In addtion to this saving, they have also, in practically every case, increased their refinery through-put or total distillation.

Have you begun to secure yours yet? If you have not, why? This may appear to be an impertinence on my part, but there is a reason for the question, and before I am through with this analysis, I shall endeavor to show you in a conclusive manner just what you are losing. Please do not jump at conclusions too soon and get the idea into your heads that I am trying to "Shoot the Bull," as it is commonly called. I will admit that I am taking a shot at a definite part of this animal's anatomy, but I shall endeavor, as best I can, to make it a "Bull's Eye"—and that's no "Bull" either.

I greatly desire to emphasize my statements with the actual accomplishments of some of the managers here present. Comparison of this character, however, usually has an undesirable odor and leaves a bad taste in the mouth. This is particularly so when the comparison is made by the other fellow. Did you ever stop to think, however, that consciously, or unconsciously, we are doing this very thing every day? Let me illustrate what I mean.

We either know or hear of some competitor who is apparently doing a very prosperous and desirable business. We recall the fact that recently he has been shading our prices a bit in competitive market, and we wonder how he gets away with it. We immediately jump to the conclusion that he has developed some secret process, or that he is securing his basic materials at a lower cost than we are. Somewhere, or somehow, we feel he has the edge on us and we are exceedingly desirous of learning his secret. Subconscious our mental reactions assume a comparative nature and we are motivated into an analysis or comparison of his, all to evident, prosperity with ours.

Our very next reaction in the comparison complex is that of obsession. We determine to learn his secret, and accordingly proceed to cultivate his acquaintance. We have now reached a condition of mind where whatever this man may say (be it fact or fiction) becomes pearls of wisdom.

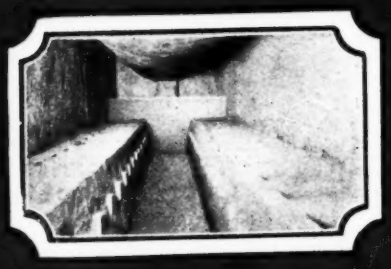
Hypnosis is the final step. We are blinded to the actual facts. We feel we must follow his advice—be it good or bad. We argue that he is doing it; and, now that we have his secret, we can do it! And in doing so, we will beat him at his own game.

Thus have sages had their genesis in the oil industry. They have come and gone. Let me ask you—how many of you today are carrying along and endeavoring to do a profitable business with some "damphool" piece of equipment or process that represents a heavy original capital investment, and cannot be charged off for years to come, with the profits you were either told, or you more often guessed, would be attained. As a matter of fact, none of these things we blindly let ourselves in for had the merit of common sense or possessed a scintilla of sound engineering principl.

The fallacy of old theories and the mysticism of secret process have all had their day and are not relegated to the limbo of the dead past.

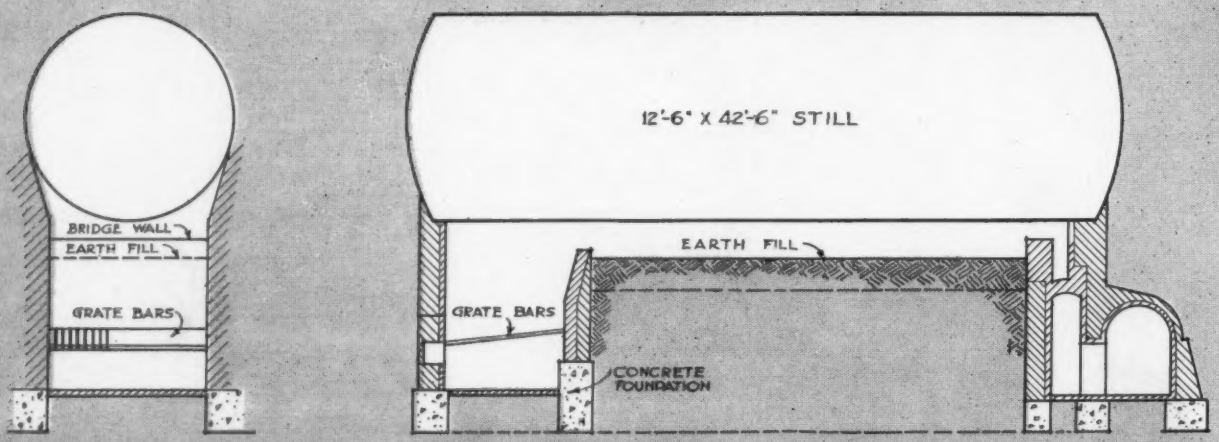
You have paid the price, but how much have you capitalized or cashed in on your past experiences and experiments. This

*An address delivered at the annual meeting of the National Petroleum Association, Atlantic City, September 16, 1926.

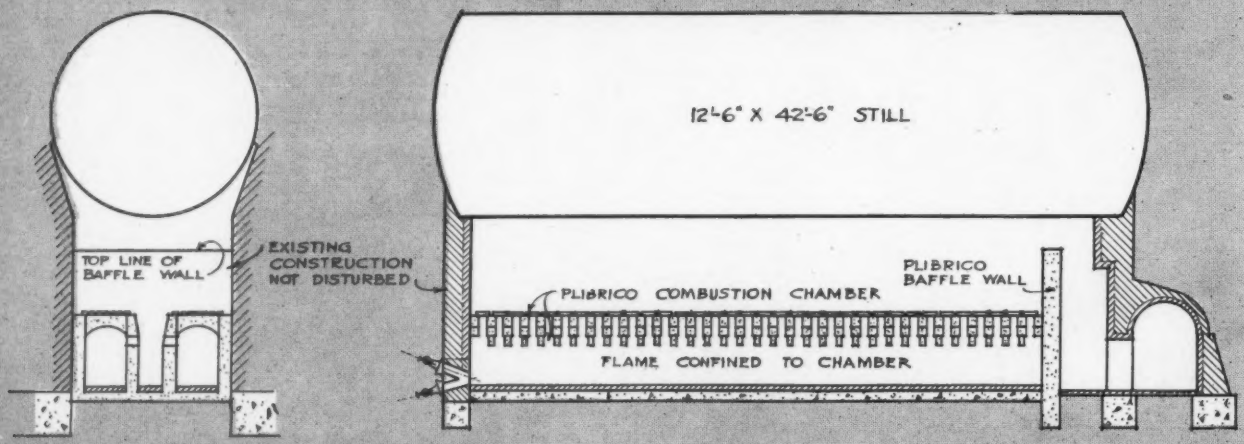


Any existing still can be equipped with the Diffusing Furnace

—at very low cost....



Before: A big Pennsylvania oil company (name on request) decided to change over two of its stills from coal to oil. This upper drawing shows their old setting.



After: The lower drawing shows how the Plibrico Diffusing Furnace, oil-fired, is being installed under the two stills. Very little change was necessary. No disturbance of the brick work was necessary.

AT low cost, the money-saving Plibrico Diffusing Furnace can be adapted to existing stills. The before-and-after illustrations above are typical.

Often, if firebrick walls are in good condition, the conversion can be made by the mere installation of the dog-house combustion chambers. In such cases, all the advantages of the Diffusing Furnace are obtained with minimum expenditure.

If your stills are operating on oil or gas, or if you contemplate changing from coal to oil or gas, we'll be glad to make up blueprints showing how the Diffusing Furnace can be adapted to your settings. No obligation. Just send a rough dimensioned diagram of your settings, tell us the condition of the firebrick, give us oil and steam pressures, and we can have our furnace engineers get busy at once. Of course, we'll be equally pleased to make up blueprints for new stills.

P. S. Remember that the Plibrico Diffusing Furnace (patents applied for) is built of Plibrico the long-lived monolithic lining. Plastic Plibrico outlasts firebrick two to four times and can be used for repairing or setting boilers or stills of any furnace construction. Warehouse stocks and engineers in 85 cities. We'll gladly send an engineer to figure with you.

PLIBRICO JOINTLESS FIREBRICK COMPANY

World's largest makers of plastic furnace linings

1865 KINGSBURY STREET, CHICAGO, ILLINOIS

Factories: Chicago and Trenton, New Jersey.

4 economies with diffused heat

1 **Buckling eliminated**

2 **Uniform temperature**

3 **Greater fuel economy**

4 **Longer furnace life**

—the flame is confined to the combustion chamber, that's why No flame reaches the still bottom.

The PLIBRICO Diffusing Furnace

—for old or new stills—for oil or gas operation

PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

is the day of mechanical achievement and the successful refining of oil is absolutely dependent upon these same mechanics, that have been developed by the science of engineering research conducted in laboratory and field.

Keep the Records

Let us start at once to cultivate the spirit of optimism and face the actual facts confronting us in our business. Let us be cautious, however, lest optimism become hypocrisy and lead us astray.

The fact that most impresses me in the refinery boiler room is the absence of any definite or systematic records of performance. There has been no lack of zeal in our endeavor to get wise to the manner in which the other fellow was operating his plant. While so engaged, we forgot, in large measure, the opportunity and saving possible of attainment in our own. Had our efforts in this particular been directly applied to our own problems, and had we remained at home and "tended our own knitting," conditions would be different today.

Comparison of what you are doing with what you "guess" the other fellow is doing, will invariably cause you to lose in the end. Furthermore, you automatically set up false standards of comparison or measurment, that are probably untrue in every particular and which cannot in any case be evaluated profitably for your own problems.

By all means, continue your comparison tendencies.—Achievement is only possible by so doing, thereby have the arts and sciences advanced. Life today is dependent upon it, and any advancement is impossible of accomplishment without its influence, and the urge to surpass that it generates within the minds of mankind. But, remember, comparison must be conducted within legitimate bounds and must always be true for any given set of conditions. When this is done, we have obtained the true standards that lead to economical progress in our business.

What I have said may seem to you to be somewhat abstruse, so I shall now endeavor to further explain what I meant with two homely statements, and then illustrate them in order to make myself thoroughly understood. First, "Don't measure your corn with the other fellow's bushel." This means that we are to use no standard other than that which has been proven true for a particular condition—and is so accepted. Second, "You cannot make a purse out of a sow's ear." Using this old proverb to emphasize the former one, I mean that you cannot hope to successfully attempt to apply any true standard you may choose to use with a mediocre order of intelligence.

I now apply this to YOUR refinery! Your basic materials are crude and fuel; one you call oil, the other coal. You endeavor at least to purchase your oil according to what you term "specification," and you sell it in like manner. This specification is a definite standard, the characteristics of which have been established by common consent and laboratory research.

When this oil is delivered to you, it is received and measured according to another standard, which we term a "pound" or "gallon". This unit of measurement has likewise been established as in the former case.

After the oil is received, we proceed to process it entirely by means of standards or comparisons that are based on percentage of yields, degrees of heat units of color and viscosity seconds. All the way through our refinery, from the raw to the finished product, we use standards of comparison, applied by the best intelligence we can obtain, and we furthermore personally check all of this operation by means of reports, calculation and tabulation, based on daily comparisons of operation, etc.

Now! All that I have said has been for the purpose of proving that you do positively guess about the most important department of your refinery, and that you know less about that department than the average six year old youngster knows about his A. B. C.'s.

What standards, what systems, what intelligence do you accord the heart of of your plant? What records have you for comparative purposes? What did you do last year—or the year previous? Upon what standards of calorific value, moisture, ash, volatile and fixed carbons, sulphur, etc., do you purchase your fuel? Isn't it a fact that so far as you are concerned—gas is gas, and coal is coal. It all burns and that satisfies you. What standards of weight, other than the suppliers invoice, do you use? After you receive your fuel what standards do you use whereby you determine the actual value of the heat you produce from it, and its quality? And finally, what is the quality of the intelligence you purchase for this important part of your plant?

Boiler Room Standards

Are you aware that certain standards have been established for your boiler houses that are just as true as those you apply in your other departments? Can we make a better start then, than to begin at the very heart of our refinery—the boiler room?

For your further enlightenments, I now purpose to present figures based on actual facts—with all the "guess" and "may-be-so" eliminated. Remembering that I told you comparisons were odious, I do not intend to cite but one or two instances as examples of what it is possible for you to duplicate. This will come later in my summation.

For the present I want to have you assume with me that we are the Board of Directors of a large corporation gathered together for the express purpose of determining why we are suffering such tremendous loss in our boiler rooms. I shall use nineteen refineries which I have surveyed to construct a composite or theoretical boiler house. I am sure that no fault can be found with comparison of this character and I also have the assurance that I will not incur your displeasure by using your particular plant as a shining example—or otherwise.

Remember, gentlemen, this is a theoretical boiler room we analyze, also that it is constructed from the actual figures, as to capacities and quantities just as you have given them to me. I want you also to understand that the figures or calculations I mention are based, or derived from, positive and definite standards as they are applied to boiler house practice today, and are universally used. No "guess", therefore, enters in to the statements I shall make in this connection.

This composite refinery has a total rated boiler capacity of 14,400 H.P. per hour, and based on an equivalent of 30 pounds of steam per H.P., is capable of generating or producing 432,000 pounds of steam per hour. I may mention here that I have discarded fractional quantities and am using round figures in order that you may follow without unnecessary mental effort.

Coal Costs

This boiler house consumes approximately 25 net tons, or 50,000 pounds of coal per hour, at an average cost of about $3.50 per ton. The daily coal consumption is 600 tons, or approximately 12 carloads, and the daily cost of the coal is $2,100.00. An interesting short tabulation of these quantities per hour, day, month and year is as follows:

	Tons Per Hr.	Tons Per Day	Tons Per Mo.	Tons Per Yr.
Coal consumed	25	600	18,000	216,000
50 ton cars	.05	12	360	4,380
Cost	$87.50	$2,100	$63,000	$756,000

Note that the yearly coal consumption costs over three-quarters of a million dollars. Note also that this cost is for coal alone. No fuel oil, gas, or other combustible is considered, nor is any cost for power purchased included. The amount stated is consumed under the boilers, or in connection with the generation of steam, and not with the stills.

The actual average evaporation in this refinery is six pounds of water per pound of coal. Now, mark closely what I am saying—this evaporation of six pounds of water per pound of coal is equivalent to five pounds of coal per B.H.P. produced, using again the basis of 30 pounds of steam per B.H.P. According to the tabulation, we use 50,000

Quotation from an editorial in National Petroleum News, page 63, issue of August 13, 1923:

Natural Price Stabilization Is Arriving

"The extensive use of cracking to produce gasoline gives refiners further the option to some extent of running on gas or fuel oil, or crude, depending upon which is the most economical; the final result tending to bring crude oil prices and prices for heavy refined oils into more stable relationship"

Only the Dubbs Cracking Process can "run gas or fuel oil or crude, de-

pending upon which is the most economical" without pre-treatment or other equipment–yes, without the slightest change when switching from fuel oil to gas oil or to crude direct

Universal Oil Products Company
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PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

pounds of coal per hour—then dividing this amount by the five pounds of coal per B.H.P., we must have developed 10,000 B.H.P. per hour. That we are correct in this assumption is proven by the fact that our equivalent evaporation F. & A. 212 degrees Fahr. is 6.3, and this gives us a combined efficiency for the boilers and grates of approximately 45 per cent. This again checks with our calculation as reported, on a basis of coal with a calorific content of 13,500 B. T. U. per pound as fired.

Effort, Not Money

We estimate from our calculation that simply by changing the method of firing the boilers, it is possible to save $10.76 per H.P. per year and that the total possible saving on 14,400 B.H.P. is $$154,940.00. Understand me, you don't spend a single penny to do this! You must spend effort, however, and I can't emphasize that statement too strongly. Show me a single individual in this audience who would refuse to add this sum to his yearly earnings, and I'll show a counterpart of that little quadruped with long ears, upon which old Balaam did his historical stunt.

Another fact occurs right here that I want to "hammer home," and that is that with proper equipment provided, in order to secure all efficiency possible, an additional $320,624.00 per year can be saved. Tis amount, and the previously named sum, make a grand total of $475,564,000, or nearly one-half million dollars year possible saving.

Now, here is where I hope to hit the "Bull's Eye." I mentioned at the beginning of this talk, I have walked through plant after plant and noted the steam that is wasted to the atmosphere directly, run to the sewer or condensed in large tanks of water, so arranged that the water is continually flowing through them and wasting to the sewer.

I have noticed steam leaks innumerable, uninsulated high and low pressure lines, and hundreds of feet of pipes filled with steam, buried in the cold earth, running in open trenches, or in low spots filled with water. In these very same refineries, I have noted the firemen at the same time working in a very hell of heat, in an effort to hold their pressure of steam, when possibly 20%, or more, of what they were producing was being directly wasted and serving no useful purpose.

When I have attempted in several instances to ask questions as to why so much steam was unnecessarily wasted, I have either been misinformed as to the reason, or have been made to feel that it was none of my business.

Let me ask, what do you cover these things up for if it is a good economical practice? What do you care if the "cock-eyed world" sees the steam that is going to waste? Why should you feel under the painful necessity of excusing yourself, if this practice is either legitimate or correct?

Save the Steam

I have often wondered where the fallacy, that steam had no further value after it was once used, ever originated. You raise the roof if your firemen let their safety valves blow for only one minute, but nothing is said about the other orifices (big and little) that are blowing steam to the atmosphere twenty-four hours a day, and three hundred and sixty-five days in the year.

This refinery wastes approximately 50,000 lbs. of steam per hour to the open air or the sewer. This steam has cost at least 50c per M pounds to produce it. Thus direct loss of $$25.00 per hour, $600.00 per day or $219,000.00 per year occurs. This amount of money will purchase 62,570 tons of coal, or an equivalent of 1250 carloads. The rejection of this steam to the sewers carries along with it all condensate at a temperature of at least 210 degrees Fahr. from absorption machines, heating coils, etc., and miscellaneous drips. This water is practically a distilled product of the boilers, all impurities have been eliminated. Consider this inconsistency! Water is secured from a stream or from wells, and in every case pumped over the still condensers. This water is absolutely raw, carries all of its original impurities and probably a lot more in addition, gathered from the open condenser box. The only virtue which it possesses is a bit of heat it carries. This is the boiler feed water supply and in order to prevent scale formation in the boilers, we purchase a feed water compound costing anywhere from $50.00 to $75.00 per drum and introduce this into the boiler along with the feed water and its impurities, thereby increasing our already high concentration. The direct result of which is a heavily saturated condition of the steam, which is carried over into your stills.

Did you ever stop to think that you could use all of this superior condensate you waste to the sewer, for boiler feed water, and thereby probably save the cost of the compounds, and, at the same time, reduce the heavy scale formation in the boilers?

There is another side to the boiler house economics to which I direct your attention, by first asking the question "How much unnecessary power are you wasting through leaking valves and pistons in your pumps and engines?" Do you know that they are tight and in good mechanical condition? Some of our refineries have spent large sums of money for labor and fuel-saving equipment of various kinds. Are they functioning correctly, and are you using them properly and intelligently?

Gentlemen, this is your composite refinery boiler house. It is yours to defend—not mine. Mark you, also, that I have endeavored to be just as conservative in my recommendations of expenditure in them, as I am in my remarks to you today. I have not told one-half that I might, for I have a due regard of the ethics of my profession and my confidential relationship with each one of you. But I feel that I must stress some facts in your assemblage this morning, because some of you seem to have an incorrect idea of my status, in this association. Get this fact, and get it correctly! I am your employee, engaged by you, to advise you how to abate boiler house loss and convert it to profit. I have fulfilled my part of the agreement to just the extent that you have individually cooperated with me. I have been just as careful of the expenditure of your money as I would of my own, and in no case have I advised you to invest a farthing until I had proven the fact that you could save attractive sums by revision of your firing methods.

Again I say to you, men are here today who are saving a good round sum of money in their boiler house because of our efforts in their behalf, and their own willingness to cooperate in the plan. Why shouldn't they be boosters for such an economic plan and entertain a high regard for it? This is the first co-ordinated effort which this association has undertaken to avail itself of the economic principles of the boiler house management and operation. Its value to you is a proven fact by the saving already made, or else indicated as possible of attainment. I make no plea of continuation of the plan, but I do most earnestly desire to sell you the idea. Nor do I stand before you in either defensive or apologetic mood.

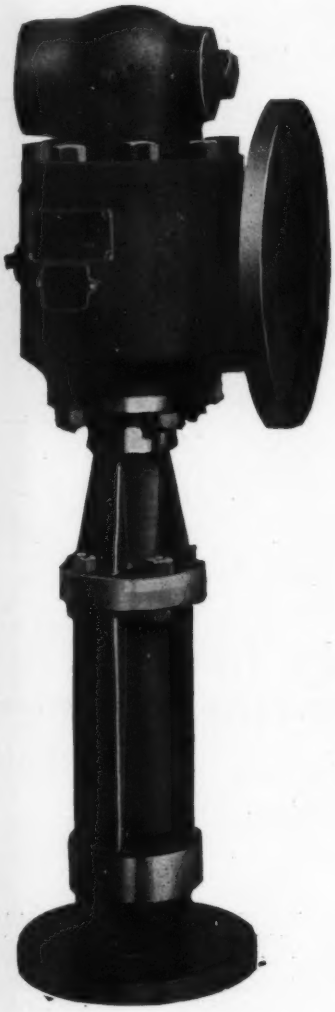
Heat Basic Factor

You engaged me to tell you what was wrong. I assumed you wanted the truth—you now have it. If I have made any errors, they are of the head and not of the heart. This work has been exceedingly arduous because of the complexities of nineteen separate organizations. No two problems have been similar in character.

We are gradually getting you into a systematic condition. Yours, not mine, will be the loss if you discontinue or neglect to carry on. Remember this fact, and this warning, heat is the basic factor of your business. Eventually you must conserve it, or be automatically forced out of the running.

Cost of production must be reduced if we hope to continue. This can only be done by intelligent and systematic effort, established on comparative records that are true standards of your particular plant.

In 1849, the average American workman produced $1,000.00 of new product per year. Today he produces $7000.00



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It is hard for a person not experienced in the use of Elliott Air Ejectors to realize that so simple a device is capable of handling any vacuum requirement.

In its simplest single-stage form these ejectors are adequate for many services and for the production of a high degree of vacuum. Two-stage and multi-stage units with inter- and after-condensers make up a range of sizes and types fitting into any particular set of conditions, and capable of producing vacua as high as can be economically utilized. There are no limits in the matter of steam pressures as these ejectors can be designed for any operating pressure and for several pressures, if need be.

Ask us how these simple, compact, flexible and efficient units can be applied to whatever service you have in mind.

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Mention Where You Saw the Advertisement

PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

worth. In 1869, or ten years after the first successful oil well was drilled near Titusville, Pa., the workmen had about one horse power with which to do his work; today he has three horse power, according to a General Electric Company statement.

Some statistics were recently published from which I quote a few figures as follows: A little over a year ago this country had only six per cent of the world population and 5.7 per cent of the total world land area. We produced at that time 38 per cent of the world total of coal; 70 per cent of the petroleum and we possess 83 per cent of the automobiles (Fords included.) We did this with power. There were a number of other very interesting facts, but I have only quoted a few at random in order to indicate how important a factor power has become in our political economy. If this is true of the country at large, it must be equally so in the oil industry. It, therefore, behooves us to set our house in order.

Now, in conclusion, I want to tell you of two refineries in this association that are operating at a high efficiency; and of one that was, but is not now, operating at a low efficiency. All three of these refineries are saving fuel that represents a handsome return on the effort they have expended. Here are two extremes of conditions, on the one hand modern water tube boilers—on the other, fire tube boilers, that are almost junk. In each case however, the management is particularly alive to its steam conservation, its production and cost.

It is a great personal satisfaction to your engineer to have an active part in their economic program and to be permitted to cite their accomplishments as concrete examples of what may be done with a little effort, and a proper evaluation of sound engineering principles applied in their plants.

My parting tribute is to you gentlemen, who are now engaged in this boiler house clean-up. I am honored by the confidence with which you are undertaking the suggestions I have made to you, and I assure you all that in so far as it is humanly possible, my most honest and sincere thought will be freely given to each of your particular problems as you afford me the opportunity.

The Influence of Psychology in the Operation of Small Refineries*

Management of Conewango plants finds that men respond when permitted to think for themselves

By Harry R. Lewis
Vice-President, Conewango Refining Co.

THERE is probably no other manufacturing process which calls for a higher rate of intelligence among its working men than the refining industry. In the refining industry, I believe I am safe in saying, that the smaller the refinery, the greater is the demand upon the intelligence of the individual worker. Refining processes are, to say the least, far from automatic and the smaller the refinery, the further removed it is from any approach to automatic processes. In other and older industries where methods and means have been developed which make their processes automatic, a less demand is made upon the intelligence of the individual worker. Probably a time in the future will produce processes in the refining industry which will make our processes as automatic as those found in other industries, such as those found in the Metallurgical field and in our "big brother" industry, the Automotive field. However, until such time as automatic processes can be applied to production in the refining field, we are faced with a very serious problem which is not as a rule, recognized, especially in the refining industry and that is that present production methods in the small refinery demand a high degree of intelligence in workers throughout the plant.

As soon as the manager of any refinery recognizes this problem, he is immediately faced with the seriousness of it. It is a problem which can only be met partially by technical methods. The other part of it must be solved by non-technical methods which I call in this talk, "the application of psychology." It is called psychology for want of a better term and I am not unmindful of the danger of a term and, for better or for worse, I shall, in this talk, refer to it as "the application of psychology." My definition of the term "psychology" is very far from that which you will find in the dictionary. The definition to which I refer is strictly home-made and is as follows: "psychology is the power of thought applied to the solution of a problem by the application of diplomatic suggestion, mostly non-technical which has as its object the assurance to the workman performing his specific task that he himself is responsible for the solution of the problem, and that his intelligence is essential to that solution."

Let Men Think

In applying the term "psychology" to this definition, we are merely recognizing the high degree of intelligence that we must depend upon from each one of our men for the proper performance of our refineries. In other words, to successfully face this problem, the manager of the refinery must first of all ask his men to follow an ideal rather than him personally. I refer to the manager of the refinery who has absolute loyalty and yet who fails to recognize that his men must have some valuable solution to methods of production and are able to think as well as he. This is a form of industrial slavery which is not very often touched upon and which results in stagnation, especially in a small refinery. Therefore, the manager would do well to act merely as a coordinator of minds rather than a dictator to loyal men who, if given the opportunity to share in the solution of a problem, could be of inestimable value to the refinery as a whole rather than to the manager personally.

At the Conewango Refining Company we have followed, as closely as possible, the policy of allowing our men to think for themselves and help us to solve our problems and, as I have stated before, the application of our definition to the solution of a problem will not wholly solve any problem. There must be technical methods and processes worked out which denote the progress of an industry and these must be backed up by applied psychology. As an example, at the Conewango Refining Company we have followed, as nearly as possible, and with excellent results, the recommendation of Mr. Ross in the Boiler House. We have applied insulation to all steam lines, we have constructed a complete exhaust steam system and we have built a system for the return of condensed steam to the boilers. We have put into operation the methods of firing as outlined by Mr. Ross which are applicable to our particular problem. Each one of these things we have supplemented with reasons why to each one of our firemen and they have responded admirably. We have further helped the

*Address delivered before the annual session of the National Petroleum Association, Atlantic City, Sept. 16, 1926.

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ATLANTIC CITY, SEPTEMBER 15-16-17

cause along by doing away with the practice of having two or three carloads of coal on hand at one time, as it is a proven fact that with two or three carloads and a bunker full that more coal will be put on the boiler. The fireman with only one-half a bunker full of coal, immediately becomes a part of the solution of the problem of putting too much coal on the boilers because of the fact that he himself uses the coal sparingly.

With the saving of coal as a nucleus, we have expanded throughout the plant and have explained to each man carefully what savings are there being effected and have shown them how the most efficient Boiler House in the world will not be a successful Boiler House, from an operation standpoint unless the steam that it is making is economically used. Then each man in the plant becomes a personal saver of steam and water because he sees the money the company is spending to effect savings and he wants to be a part of making that investment a success, provided it is properly explained to him. We have proven that we are not overtaxing the intelligence of our workmen by reasoning with them to this extent and we have gone one step further by applying the same means of making each individual man a part of the successful operation of the plant by extending the methods to the saving of oil.

Perhaps the biggest test of the application of psychology to the solution of a problem in our plant was made when in the eyes of each one of our workmen, we ceased to operate our No. 2 plant as an auxiliary unit in connection with No. 1 plant and actually maintained a production in one plant equal to what both plants were putting out. Each man in the plant accepted a responsibility when we made this move and took pride in showing what their particular plant could do without the help of the other plant.

At no place is the application of psychology to the solution of a problem of any greater importance than the preparation for fighting fire and the prevention of fire by the elimination of fire hazards. You will find that frequent fire drills and adequate fire fighting equipment give your men assurance and coolness in the face of danger. Our plant has been divided into seven sections. In each section there is a signal button which communicates directly with the Boiler House where the fire whistle can be blown a certain number of times denoting a certain section. The use of these signal bells assures the man who is alone in a more or less remote part of the plant that within fifteen seconds, he can inform the entire plant of a fire. Each man in the plant has a definite duty to perform in the case of a fire in any one of the sections. A complete outline of this system has been brought to the meeting and if you desire to look over the detail plan, you will find it on the Speaker's table after the meeting.

The National Petroleum Association, during the past three or four years has made wonderful progress and at no place has this progress been better exemplified than in the spirit of helpfulness which has been manifest between the production units of all refineries, as the result of the splendid work by the Department of Manufacture. We, at the Conewango Refining Company, have profited greatly from the spirit of helpfulness displayed by every refiner in the field, and I wish, at this time, to express our appreciation of this spirit and to assure you that if we can contribute, in any way, by helping any Pennsylvania refiner to meet some of his problems, that we will be more than glad to have him visit our plant. That is a standing invitation.

New Lessons From an Old Hazard*

By Houston Dunn

THE title which has been assigned to me brings to my mind the old adage that "Wise men alone profit by the experience of others." In previous addresses before you it has always been in the capacity of an insurance man, and while the remarks that I have made upon such occasions have borne upon the subject of fire prevention, the main topic of my theme related to fire insurance. This time, however, in the capacity of Managing Director of the Fire Marshal's Association, I desire to lay before you facts, figures and conclusions drawn principally from the reports and operations of that organization to the end that the executive managers of refinery properties may accord their moral encouragement and support more actively to the fire marshals.

Probably in no record of the Petroleum Industry has a greater fire occurred than that of the Union Oil Works in California. In addition to the tremendous losses to the insurance companies must be added the loss of time and trade to the operating company. The recent report of the government commission may or may not be correct in its conclusion that the oil supply of the United States will not survive beyond six years, but, in any event everyone must recognize that the tremendous volume of petroleum products destroyed in California will be a distinct economic loss to the country in the destruction of petroleum products thus removed from the markets. Perhaps no one in advance would have considered the California catastrophe possible as it happened. It illustrates, however, that the unforeseen may occur at any moment and shows the danger of practices pursued over a long period of time which were previously considered safe. For years past, refineries have been considered almost immune from total destruction. Then comes a great fire in Warren burning for nearly a week, totally destroying a large refinery and jeopardizing another nearby. It is true that the elements were responsible for the disaster in California, but it is likewise true that the possibility of lightning occuring should have been guarded against. In the construction and arrangement of the property this should have been taken into consideration. It proved futile to install fire fighting devices near an open reservoir of oil of such tremendous capacity that the heat generated from fire therein would be impossible to control. Prior to the fire, the lightning hazard in that locality was regarded as negligible. On the other hand, at the Warren refinery had the proper safeguards been provided, this fire would never have reached its final proportions. These two instances are, therefore, alike in one respect; namely, that the construction of the property lent itself to a conflagration while each owner rested in the false security that his property was immune from a large fire and if the possibilities thereof had been previously pointout to him, doubtless the reply would have been that it had never happened before and that in the operation of his business he was too busy to give thought to such remote contingencies. It has happened, however, and nearly nine million dollars have gone up in smoke, and unless due heed is taken of these instances, at least the Warren refinery loss can and may be repeated elsewhere.

Slow to Act

In the organization of the Fire Marshals' Association the National Petroleum Association incorporated one of the most important pieces of work that its years of useful duty has performed. Like many other movements of precaution, it is difficult to get the majority of persons to appreciate the necessity for this work and to lend active support to it. The theory is thoroughly recognized but the practice is not so readily adopted. You have been apprized of the companies who have appointed Fire Marshals and in a general manner the regularity and irregularity with which the work is being done. In the main, I consider that a great step forward has been taken in securing even a few companies to require of their Fire Marshals diligent and active service, and I have every confidence that the future will materially multiply the number and that this great conservation movement will ultimately be extended to the entire oil industry. In the meantime, however, for the benefit of those who are co-operating and the instruction of those who are

*Address at the Annual Meeting of the National Petroleum Association, Atlantic City, September 15, 1926.

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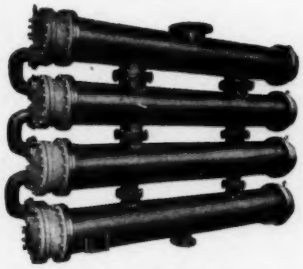

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PROCEEDINGS OF EASTERN REFINERS' MEET

ATLANTIC CITY, SEPTEMBER 15-16-17

not, it might be well to review some of the lessons which can be learned from the monthly reports of the fire marshals and the reports of the fires which have reached the association.

The Union Oil Works fire shows the hazard of open storage and upsets all theories theretofore established as to the distances which would separate such reservoirs. As this method of storage does not prevail in the east, such a fire could not occur in this territory, but, the publicity may react upon the eastern refiner to his disadvantage and it behooves him, therefore, to keep the units of his property so segregated as to prevent a conflagration of great proportions. I have in mind the recent erection of some 80,000 barrel steel tanks to contain gasoline, and I do not believe that this practice should be encouraged by the industry. I have no desire to offend anyone nor is it the purpose of this address to disclose anything of a confidential character, it is necessary, however, to present for your consideration certain elements of danger which exist in some localities. All these would be easily distinguished by anyone who looked over the ground with the thought of fire in mind and the picture of the Warren Refinery loss before him. It is admitted that the majority of refiners use due diligence to prevent a fire and maintain a fair condition of housekeeping. However, while this goes a long way toward the prevention of a fire, nevertheless, should one get actively started the character of construction of many of these refineries is such as to lend itself to the spread of the flames. For instance, several properties are constructed with large tanks located on a hill nearby overlooking the main refinery. If these tanks should burn there is every prospect that the burning oil would overflow the refining sections. Many of the refiners have old tanks some with wood top roofs and some with metal roofs so badly corroded that they have large holes in them. These tanks are used for holding all kinds of petroleum products as occasion demands. There is undoubted gasing from time to time and such gas could be ignited from a variety of causes.

Carelessness First

All such general conditions as the foregoing call above everything else for an adequate, intelligent and frequent inspection of these properties to see that fire does not start. It should likewise be the duty of those in authority to thoroughly investigate the capacity of the fire fighting equipment in conjunction with the Fire Marshal whose recommendations should be discussed with respect and with whom a definite program for upkeep and the development of the fire system should be outlined and carried out. Whether or not modern processes of manufacture in the Petroleum Industry have increased the hazard of fire, I am not definitely prepared to state, but it is undeniably true that more fires are being reported from what appears to be phenomenal causes and it is likewise true that these fires assumed proportions beyond those of former years adding to the difficulties and complications of fighting them. The old statement that seventy-seven per cent of all fires are caused by carelessness is as true to-day as when made. Carelessness, however, is a broad and inclusive word insofar as an oil refinery is concerned and its interpretations should not be confined to clearing out accumulations of debris and confining attention to matters of housekeeping, but it is just as much carelessness to neglect the condition of gaskets in the pipe lines and piling of ashes against frame buildings, whether such ashes are supposed to have been cooled down or not, or allowing fire apparatus to be so located as to be in proximity to explosive materials.

There is a popular idea that insurance companies should inspect properties frequently. If they endeavored to do this, the expense would be increased and these would have to be loaded back upon the purchaser of insurance. Insurance companies, therefore, inspect properties with two thoughts in mind. Is the rate adequate, and is the risk a good one at the rate? Apart from these two considerations the maintenance and protection of the premises rests upon the owner thereof to whom the continued and uninterrupted operation of his business should be of much more importance than the payment of a fire loss would be to an insurance company. Constant vigilance can be secured through the active service of a Fire Marshal and as these Marshals in Association assemble and discuss their experiences and observations great benefit will accrue to the refining industry. It will be difficult and trying for the Marshal to repeatedly bring to the attention of the executive the same deficiencies in his property, and the executive may in due course have a tendency to resent the constant demand to spend money in anticipation of a catastrophe which may never occur. It is the easiest thing in the world to keep deferring improvements of this character, but unless the Fire Marshal continues to press upon such points the ultimate benefits to be derived through his service will not accrue, and the executive must learn not only patience in listening to these recommendations but encourage the work of the Fire Marshal by steady and gradual acceptance of the conditions laid before him. On the other hand, it is not enough for the Fire Marshal to fill out monthly a printed form of report reciting the physical cleanliness of the property and the general conditions of the fire apparatus. To be of real value to his employer he must be at the same time study the conflagration hazard which exists by the presence of frame buildings, the congestion of tankage and other like broader matters referring these with his recommendations to the executive and protesting with the utmost vigor unless some action is taken to remedy these conditions.

As a matter of fact, I do not know whether there was a Fire Marshal at the Warren refinery or not, but I do know that he did not belong to the Fire Marshals' Association and I am inclined to believe that if a marshal had made an inspection monthly at the property some of the conditions which lead to the spread of the fire would have been remedied. Originating from an explosion, this fire was undoubtedly spread by pools of oil which lay under a lattice-effect boardwalk throughout the pump house. The fire-pump being located in this pump-house was immediately put out of commission. It would seem a logical conclusion that a condition of this character would have been discovered and removed by the efficient service of a Fire Marshal. From the testimony of eye-witnesses it also seems a logical conclusion that had adequate fire fighting devices been on hand this fire could have been confined to the boiler-room and pump-house. A competent Fire Marshal would have corrected this deficiency. He also would have tested the fire hose on the premises with regularity and worn out sections containing holes and leaks would have been replaced with proper material.

Inspect pumps

"New Lessons from an Old Hazard" is a misleading title, rather we should say "Old Lessons from a Recent Experience." Act while the subject is fresh in your minds and as a concrete suggestion I would recommend to each refiner here present, a careful and exhaustive investigation of the fire-pumps at his property. From the reports handed to me recently by my Engineers, at many of your refineries at is quite within the range of possibility that the pump could be crippled early in a fire. A fire-pump should be located in a building erected specifically for the purpose of a fire-proof material; it should be remote from other buildings and not subject to damage by explosion hazard; the steam lines should be continuous from the boilers and should be laid underground. The fire-pump should be reserved for fire apparatus exclusively and not used in the operation of the business. All water pumps should be equipped as fire emergency pumps but these should be regarded as auxiliaries only. For incipient fires chemical engines of forty gallon capacity should be maintained, but I am still of the opinion that an adequate water supply is the best method for preventing a conflagration. At many of the refineries today the steam lines running to water-pumps could easily be damaged and the efficiency of the pump thereby destroyed.

I would be remiss if I did not pay tribute to some eight or ten of the Fire Marshals' who have reported with the

(Continued on page 66.)

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ATLANTIC CITY, SEPTEMBER 15-16-17

Products and By-Products of Association Work*

By O. P. Keeney
President of the National Petroleum Association

WHEN Mr. Dow assigned me the subject "Products and By-Products of Association Work" the first thoughts that came to my mind in relation to it were of the meat packing industry. The meat packers are reputed to utilize completely all the animal products and by-products, down even to the squeal of the pig. Then, naturally, came the thought as to whether or not the members of the National Petroleum Association were completely utilizing all the products and by-products of Association Work.

I do not wish, pessimistically, to assume an universal negative and argue on the assumption that all of the members are not fully utilizing all the possible products and by-products of the National Petroleum Association. But I cannot honestly say that all the members have even approximately attained all the possibilities. An adequate realization of the possibilities of the National Petroleum Association makes more possible their attainment.

To paraphrase from Cornwall's famous allegory: There are treasures of opportunity so readily accessible and so familiar that we overlook them. How many acres of diamonds do you see. The more you see, the more you can yourself acquire.

For Your Company

Have you ever leaned back in your chair, put your feet on the desk and asked yourself the question, "Why do I support and help the National Petroleum Association?" The tip-of-the-tongue and unthinking answer would be, because you feel that it is worth while and because you more than get your money's worth. That is all true, but there is a bigger and broader answer. Some of you vividly remember, and all of us know, the reason for the formation of the National Petroleum Association. Just the good old proposition of hanging together to prevent being hanged separately. But this is a different day. There are other reasons for taking part in the National Petroleum Association Work not so apparent, but fully as important. The possible products and by-products of the National Petroleum Association of today are the justifying reasons for membership and active participation in its work.

The most valuable products and by-products for you may not be the same as for me. Each can very largely choose and use the ones which will be most useful and profitable to him. There is self-determination both as to choice of products and value of by-products. While the products differ they will all be included under the typically Twentieth Century heading—Progress—Progress for your company in various phases: Cutting operating costs; legitimately improving marketing conditions; information and assistance on traffic matters; solving of knotty legal and tax problems; wiser interpretation of vitally important trade statistics; preventing unnecessary fire losses, both of property and life; increasing earnings through more intelligent supervision of operations by improved cost and general accounting methods; avoiding unnecessary and unpleasant disputes with customers in regard to quality of products; improving the attitude of the public toward our industry; legitimate efforts against unfair legislation; provision of a readily accessible forum for discussion of mutual problems; securing new ideas from inspection visits to other refineries; acquiring helpful technical knowledge from inter-laboratory visits; securing greater uniformity in testing methods and establishment of better standards and specifications; interchange of credit information; welfare work for employees; pension plans and accident prevention.

These are some of the possible products and by-products for your company. Do you think I have painted too rosy a picture? Every phase I have mentioned is already in the program of activities of the National Petroleum Association. We are most fortunate in having the services of Mr. Dow and his talented and energetic assistants. Enlargement or improvement of this program or your getting more than you may have been getting in the past does not depend upon the depend upon, the employed officers but upon the individual response in voluntary service from the members.

For Yourself

But there are also products and by-products for the individual. These too, all fall under the heading of progress—progress for you in these phases: Wider range of friendship; contacts helpful in making you worth more in your job; increased knowledge of all the technical theoretical and practical phases of one of the most complex industries in the world; knowledge of the men and the affairs vital to your success, development of your qualities for leadership; self education gratification of reasonable ambition and satisfaction—the satisfaction of service, the satisfaction of helpfulness the satisfaction of worthwhile accomplishment, your money's worth, you can not get all of your money's worth without putting something of yourself into National Petroleum Association work. It is axiomatic that the more you put in the more you get out.

The National Petroleum Association has the longest history of any oil association and also the finest traditions. Money didn't make the wonderful record. Personalities, ideals and unselfish service brought us this heritage. Man is debtor to mankind. You can't pay your debt by only paying your dues. These are the reasons why the most valuable products and by-products of National Petroleum Association work can not be bought with money but require unselfish service.

Of course, most of us have our bread and butter job, our time is not solely our own and there are countless other uses for our time and energy, both for profit and pleasure. But where there is a will there is some sort of a way. Nothing unreasonable or out of proportion is either expected or desired from any standpoint. Some time during the year and in some way you can make your reasonable contribution of personal service. There have been many contributions of this sort to the National Petroleum Association.

I hold to the truth of this proposition: that the products and by-products of National Petroleum Association work which have paid the donors in the past will amply pay every donor in the future.

Prove this proposition to the profit of your company and to yourself.

*Before National Petroleum Association, Atlantic City, September 15, 1926

Tulsa, Oklahoma. — The Refinery Supply Company is distributing a new golder, which lists several of the outstanding instruments sold through its Tulsa and Dallas stores. The front page is given over to a view of each the Dallas and Tulsa stores.

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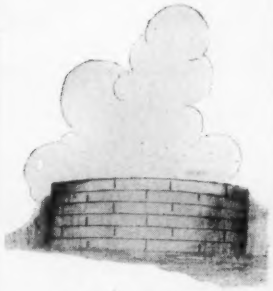

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How Shall Refiner Responsibility and Management Be Distributed?

(Continued from page 34)

and, when necessary, the work laid out and designed and its cost estimated—by the head of the construction and repair department. In addition to the resident engineer at each of the larger refineries, the chief engineer also has under his direction a chief draftsman and, when new construction work warrants so doing, also a foreman in charge of brick work (F-1) and another foreman in charge of iron work (F-2).

At each refinery is located a refinery superintendent who is responsible to the general superintendent. In this particular company, as previously has been mentioned, when the need for economy in operations made necessary so doing, the general superintendent also acted as refinery superintendent of the main refinery of the company.

Each refinery superintendent has under his supervision:

1. Laboratory work, which is under the immediate direction of the refinery chemist, but is subject to checking by the company's chief chemist, who is at the head of the Standardization Department (G-1, H-1, etc.).

2. Construction and repair work, under the immediate direction of the resident engineer, but at all times subject to checking by the company's chief engineer, who is at the head of the Construction and Repair Department (G-2, H-2, etc).

3. Processing operations, and boiler and power house operations, and matters relating to the operation and maintenance of all other units of the refinery—are subject to checking by the general superintendent of refineries (G-3, H-3, etc).

Control System

Fig. 3 indicates a unique departure from ordinary methods for distributing responsibility in a refinery organization in that it shows as being in existence a so-called "Control and Standardization Department," at the head of which is a Chief Chemist or Supervisor of Control who is responsible for control work at all refinerise, for technical developments, and for the standardization and uniformity of all products from all the different refineries. The head of this department works with and is partly responsible to the general superintendent of refineries, but is also responsible to the vice-president in charge of refinery operations.

Fig. 4 shows a flow chart indicating the method in which responsibility is distributed by the refinery superintendent in one of the refineries operated by the company whose manner of distributing responsibility has just been discussed in preceding paragraphs.

By this method yields and costs are kept by a clerical department under the direction of a chief clerk, who, in turn, is responsible for the same to the refinery superintendent. The power house, boiler house, and other units not directly connected with any particular refining unit are under the supervision of a master mechanic, who is responsible both to the resident engineer (although it is not so indicated in Fig. IV) and to the refinery superintendent. Repairs and maintenance work are "looked after" by the resident engineer, who is responsible, first, to the refinery superintendent and then to the chief engineer of the company. All matters relating to shipments of finished products are in the hands of a shipping clerk, who is directly responsible to the refinery superintendent.

The assistant refinery superintendent, primarily, is a lubricating oil superintendent, and as such is responsible for all matters relating to the lubricating oil department. In this capacity, then, he is in charge of the lubricating oil agitators, where wax distillate, lubricating oils, cylinder stocks and waxes are treated; of the filter house, where lubricating oils are filtered; and of the wax plant, where the wax is removed from the unfinished lubricating oil. The assistant superintendent works with the crude still foreman in seeing that all lubricating oils and stocks are reduced to the proper point; is in charge of wax sweating and wax moulding operations; and, finally, directs the operation of the compounding and barrel house where lubricating oils and waxes are first blended, when necessary, and then shipped either in barrels or in tank cars.

Superintendent Responsible

The refinery superintendent calls on the assistant superintendent for aid in directing the operations of any of the other departments whenever it becomes necessary to do so. The general practice in the operation of this particular refinery, however, was for the superintendent himself to assume responsibility for the processing of all other products except lubricating oils and waxes. Hence, it is so indicated in Fig. 4. Such processing operations involve for the most part, the primary distillation of the crude oil (wax distillate and cylinder stocks obtained from the crude being sent to the lubricating oil department for further processing); the re-running, when necessary, of gasoline, kerosene and other light oils in steam stills; the treatment in light oil agitators of gasoline, kerosene and other light oils and, occasionally, the filtration of same; and, finally, the operation of the acid recovery plant, where acid is recovered from acid sludge.

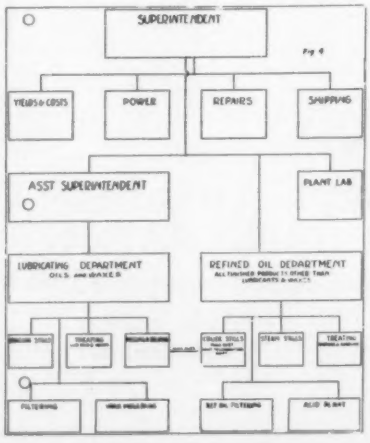


Figure 4.

The plant laboratory is in charge of a refinery chemist, who is responsible, first, to the refinery superintendent and then to the Chief Chemist, who is also head of the Standardization Department.

For a Big Plant

Fig. 5 shows the method followed in distributing authority and responsibility in the operation of the 10,000 barrel refinery of Producers and Refiners Corporation at Parco, Wyoming. This flow chart was followed for quite a long period of time at the Parco refinery, but was later modified in the manner shown in Fig. 6, this latter chart being the one that is now in effect at that refinery.

Figure 5 requires but little explanation or further comment, since a careful study of it will indicate it to be entirely self-explanatory.

In this flow chart, it is to be noted that the Office Manager is responsible both to the company Auditor and to the General Superintendent of the refinery. The duties of the Office Manager involve the supervision of the shipping of finished products; general accounting work; all cost and yield accounting work; timekeeping; and all correspondence of a general nature. He also works with—but is not necessarily subordinate thereto—the Process Superintendent in the matter of shipments and in getting all cost and yield data in correct form.

The Refinery Purchasing Agent is subordinate to the Chief Purchasing Agent, whose headquarters are located at the company's main office, and he is also directly responsible to the General Superintendent. The refinery purchasing agent is also a chief warehouseman

A Chief Engineer says the

Quigley Refractory Gun

REPAIRS FURNACE WALLS:

"On one of our boilers we repaired two large cracks each about ¾" wide and 4 ft. long restoring the wall to its original condition. The Gun placed the mixture where it was **impossible to get at the job by hand.** And the repairs were made in an hour and a half.

MAKES BAFFLE REPAIRS:

"We recently rebuilt nine square feet of baffle in one of our boilers in **two hours** with the Quigley Gun.

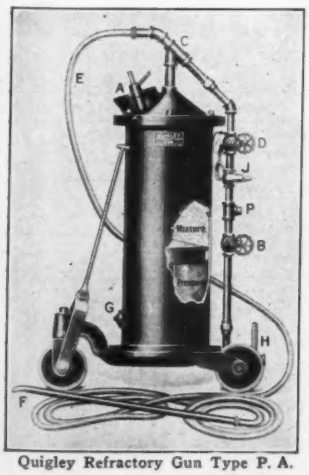
AND NEW BAFFLES:

"We built complete inclined baffles in six of our 478 H. P. B. & W. boilers, using a mixture of HYTEMPITE and ganister. We shot the mixture against lattice forms with the Quigley Gun. **It took only 15 hours** to complete a baffle.

In this typical repair job the operator steps close to the wall to fill large cracks or holes. Then he backs away a short distance for an even distribution of the plastic material over the surface. If coating thicker than ¼-inch is needed apply in successive layers.

ALSO—

"We certainly are very pleased with the Quigley Refractory Gun. It saves us considerable money on maintenance and we get a much better job."



Quigley Refractory Gun Type P. A.

Booklet RG 130 tells you how to

Fill Cracks or Holes

Restore a Burned Out Wall

Fill Gaps in Walls or Arches

Repair Leaky Baffles—Build New Baffles

Re-surface Old Walls—Surface New Walls

Mix the refractory material with HYTEMPITE in a mortar box close to the GUN if possible.

Booklet RG-130R for more details.

Quigley Furnace Specialties Co., Inc.

26 Cortlandt Street **New York**

***Makers of* HYTEMPITE**

Stock and Service in Every Oil Field and Industrial Center

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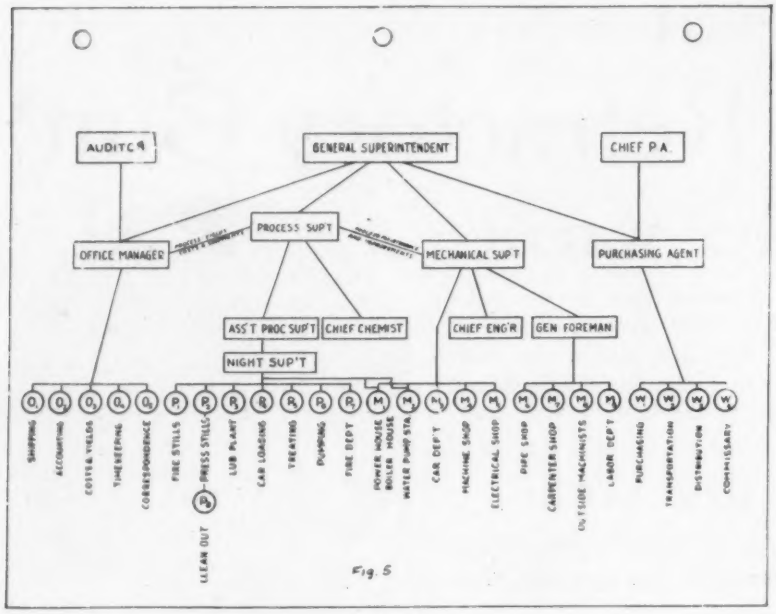

Figure 5.

and hence, in addition to having charge of the purchasing of all supplies for the refinery, also is in charge of the distribution of those supplies after they have been purchased; of all rolling stock (trucks, etc.) of the refinery; and is also head of the commissary department.

The Process Superintendent is directly responsible to the General Superintendent and works with the Mechanical Superintendent (who likewise is responsible to the General Superintendent) in all matters relating to the maintenance of, and improvements in, all equipment used in processing operations.

Directly under the supervision of the Process Superintendent are the Assistant Processing Superintendent and Chief Chemist — the latter being in charge of all laboratory control, research and experimental work. A night superintendent (night shift foreman) is responsible for the operation of the refinery at night. In addition to "looking after" regular processing equipment and operation of same during the night time, this night superintendent is also responsible for three different units of the mechanical department—namely, the power house, boiler house, and water pump station.

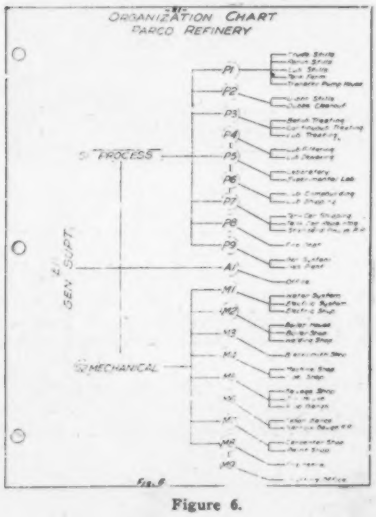

Figure 6.

Mechanical Superintendent

Ordinarily, the Process Superintendent is responsible for the operation of the fire stills, pressure stills (and of the clean-out of same), lubricating plant, agitators (treating), pumphouse (transferring of products from one point to another within the refinery), car loading, and of the fire department. Each department has its own foreman who is responsible for the operations of that particular department.

The Mechanical Superintendent is assisted in his work by a Chief Engineer and a General Foreman, both of whom are directly responsible to him. The general foreman is in charge of the labor department, the pipe and carpenter shops and of all outside machinists. The Mechanical Superintendent usually assumes responsibility for the remaining departments—namely, the boiler and power house; water pump station; car department; machine shop and electrical shop.

Fig. 6 shows the Organization Chart of the Parco Refinery of Producers and Refiners Corporation as it has been in effect since February 1, 1926.

This chart is characterized by the readiness with which the duty of each foreman is clearly discernible, and to whom each person in authority is directly responsible.

The organization is divided into two divisions—process and mechanical. For reasons of economy, the general superintendent also acts as head of the mechanical department.

P-1 represents a foreman—in reality, an assistant process superintendent—who is in charge of the 20 fire stills (crude, re-run and lubricating stills) at the Parco refinery; and in charge, also, of the tank farm and transfer pumphouse.

P-2 represents a foreman in charge of the operation of the Dubbs pressure stills and of the clean-out of the Dubbs expansion chambers each time they become filled.

All treating—light oil batch treating, continuous light oil treating and lubricating oil treating—is in charge of a "Treater Foreman" or "Head Treater" (P-3).

Chief Chemist

The Chief Chemist (P-5), in addition to having charge of the control, research and experimental laboratories, also has general supervision over the units in which lubricating oils are filtered and dewaxed (P-4) and of the compounding and barrel house, in which unit lubricating oils are compounded and later shipped in either barrels or tank cars. Hence, this division of responsibility is so noted in the organization chart. Ordinarily, one foreman is immediately in charge of the filtering and dewaxing units of the lubricating plant; and another foreman, in charge of the compounding and barrel house. However, due to lack of sufficient finished oil storage at the Parco refinery, the lubricating oil plant is temporarily closed down and hence, at the present time, the foreman who is in charge of the barrel house is, temporarily, in charge of the filtration and dewaxing plants.

An interesting deviation from most refinery organization charts is shown in the duties of the foreman (P-7) who is in charge of tank car shipping and repairing and of all standard gauge railroad tracks. This is an unusual arrangement made possible, primarily, only because the experience of the foreman in charge of same has includ-

WHISTLE SIGNALS

NAME	NO.	SIGNAL
GENERAL SUPERINTENDENT	1	—
PROCESS SUPERINTENDENT	2	• —
PRESSURE STILL FOREMAN	3	• • —
CRUDE STILL & TRANSFER PUMPHOUSE FOREMAN	4	• • • —
LOADING RACK FOREMAN	12	• — • —
FOREMAN OF PUMP REPAIRMEN	13	• • • —
FIRE CHIEF	14	• • • • —
FOREMAN OF ABSORPTION PLANT	21	• • — •
POLICE	22	• • • —
----------	23	• • • • —
FOREMAN OF PIPE GANGS, TOOL HOUSE & SALVAGE SHOPS	24	• • — • —
----------	31	• • • — —
FOREMAN OF LABOR GANGS	32	• • • — • —
CARPENTER & PAINT SHOP FOREMAN	33	• • • — • • —
FOREMAN OF BOILER HOUSE & BOILER & WELDING SHOP	34	• • • — • • • —
FOREMAN OF WATER & ELECTRIC SYSTEM & ELECTRIC SHOP	41	• • • • — —
----------	42	• • • • — • —
----------	43	• • • • — • • —
----------	44	• • • • — • • • —
FOREMAN'S MEETING	55	• • • • — — • • • • — —

Figure 7.

JENKINS CRACKING PROCESS

PRODUCES QUALITY GASOLINE

Facts from performance

A FIRST IMPRESSION

An interested refiner inspecting a Jenkins unit on approaching the plant asked why it was not running.

It *was* running at full capacity, quietly, with no escaping fumes, producing only gasoline and fuel oil, and doing this over 90% of the time.

GRAVER Corporation Founded 1857

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ed prior experience as a shipping clerk and experience in and familiarity with (as a result of previous railroad experience) the problems encountered by railrods in handling and repairing cars. It is to be noted, also, that this foreman gives shipping instructions to the foreman of the barrel house, and hence this, too, is indicated in Fig. 6.

Fire Chief

The Fire Chief (P-8) and the foreman in charge of the gas system and of the absorption and compression gasoline plant (P-9) are both directly responsible to the Process Superintendent.

Ordinary refinery office work is handled by only one man (A-1) who, in reality, is a private secretary to the General Superintendent. This, too, is a very unusual feature of refinery management, which is made possible only because of a co-ordination into one department at Parco of all work relating to general accounting, cost and yield accounting, timekeeping, etc., of all the production, pipe-line and refining departments, in Wyoming, of Producers and Refiners Corporation.

Seven foremen hold primary positions in the Mechanical Departments, the duties of each being as follows:

1. Foreman M-1, in charge of water and electric systems and electric shop.
2. Foreman M-2, in charge of boiler and welding shops and boiler house.
3. Foreman M-3, in charge of blacksmith shop.
4. Foreman M-4, in charge of machine and pipe shops.
5. Foreman M-5, in direct charge of salvage shop, tool house and pipe gangs; and supervises the work of another foreman, M-6, who is in charge of all labor gangs and of the operation of the narrow gauge railroad system.
6. Foreman M-7, in charge of carpenter and paint shops.
7. Foreman M-8, in direct charge of the engineering office; and supervises the work of another foreman, M-9, who, as Chief Draftsman, is at the head of the Drafting Office.

Aside from what has been said, a matter that may be of interest—since it pertains to refinery management—is the method of calling different foremen at the Parco refinery by whistle signals, when they can not be reached by phone.

Fig. 7 shows the "calls" that are used and indicates which particular foremen are subject to whistle signals. The method of "calling," in itself, is somewhat novel. To avoil confusion, the last part of the whistle call is made long and drawn-out (the first "blows" of the whistle are short)—thus indicating to the listener the end of that particular "call. "

Making Safety an Individual Matter

(Continued from Page 24)

be good engineers, oilers or even roustabouts around a gasoline plant. Experience is of little value to them They take unnecessary chances and continue to do that as long as they are around machinery.

Machinery Complex

The best way to handle that sort of man is to put him in some other line of work. Machinery is not his line, just as bookkeeping is not the line of a ball player. That gets over in the psychological makeup of individuals.

The second class of unsafe workmen is the new man. A man comes out of the yard gang into the plant. Put to cleaning a floor, cleaning machinery or oiling, he does not know what dangerous practice is. So each superintendent drills his crew to watch the new man.

None of these efforts to make safety an individual matter, relieves the company of providing equipment that will make its plants safe. Special equipment may be directed at preventing only 10 per cent of accidents, but this portion is as important as the remaining 90 per cent.

Cleanliness First

Cleanliness is the first item in this and it gets back to the workmen. So both buildings and grounds are kept clean. That is to insure men taking pride in their plant. When no article is left out of place, there is less inclination to leave tasks half finished or tools out of place.

All equipment is provided with guards of the latest type. But it is not assumed that the presence of a guard around belt space and drive wheels is sufficient to keep men from being injured there. It is necessary to clean floors around belts and there are proper methods of doing it. So men are instructed in such minor details.

Perhaps the outstanding piece of safety equipment around a Phillips natural gasoline plant is the "steam snuff line." By opening a valve, of which there may be a dozen over the plant, fuel is cut off and steam discharged into all fire boxes. This equipment is the product of the Phillips engineering department.

Two Chaplin-Fulton regulators are the essential parts of the equipment. They operate on pressure from the gas residue line, which is constant. One regulator is set in the plant yard on the fuel line of boilers and stills. When pressure is released, this regulator shuts off the gas to all burners.

Simultaneously another regulator, working on the reverse of the other, opens, releasing steam into each fire box of the plant. A typical installation is to have these regulators controlled by eight valves about a plant. Two are in the yard, two at the stills and four in the engine room. By opening either of these valves all plant fires are immediately extinguished.

Act Then Investigate

And every man on tour knows his duty when he hears or sees anything that may mean a fire. If there is an explosion, a man's duty is to get to a steam snuff line valve in the quickest time and open it. That puts out all fires. The exposion or other accident can be investigated later. With the fires out, danger to the men and the plant is lessened. Effectiveness of the equipment has been tested several times, following an exposion.

Plant fire hydrants are set in open spaces, to allow free use of hose. Houses for fire equipment are segregated from other buidings.

Matches have many proper places but a Phillips plant is not a proper place. Each plant gate carries a warning to that effect. But the machinery to prevent visitors, or others, entering with matches does not stop there. Office clerks never hesitate to ask any visitor about matches. Neither do they hesitate to refuse a man admittance, until he searches his pockets for matches. It is common to see district superintendents leaving their matches in their cars before entering a plant.

Hospitals Provided

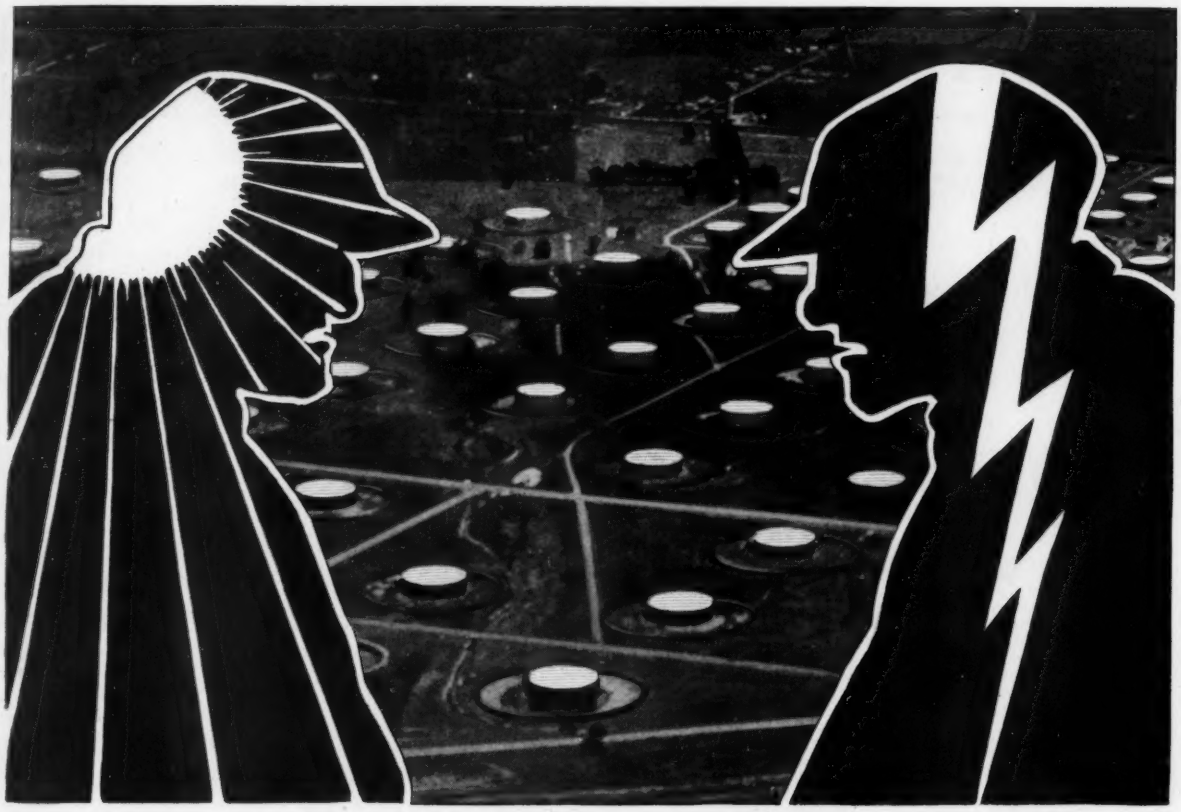
Two workmen may meet and one dare the other to turn pockets wrong side out in a "match showing contest." And it would be a sad day if one produced a match, for there is a penalty that the men take delight in applying.

At Burbank and at Panhandle, Texas, the Phillips company maintains hospitals. Each has its staff of physicians and nurses. Where activity is not sufficient to warrant maintaining a hospital, the company has a designated local physician to care for employes.

Physical examinations are required of all men working for the company.

But this whole effort on the part of the company to select men physically fit to work, to provide devices to prevent accidents, to control fires and to care for men in case of accident is not set up as the major effort of the safety ampaign. Investigations have convinced company executives that only 10 per cent of accidents can be prevented by mechanical means. So there is no desire to have workmen believe such efforts are of major importance.

What is sought is to have each man come to know that his own efforts are of major importance in preventing accidents. He is no safer than the action of himself and his fellow workers. When a man reaizes that, he is headed toward safe working methods.



Robbers of storage tanks
—evaporation and lightning

SAFEGUARD your tankage against these two great thieves of stored oil and gasoline.

Johns-Manville Vapor Tight Tank Insulated Tops* cut evaporation losses to a minimum, as has been demonstrated on tankage of millions of barrels total capacity.

We have developed an effective system of protecting tanks against lightning, which includes Johns-Manville Grounded Conductor Network.** Upward of twenty-seven million barrels oil reservoir storage is now using this protection.

Complete information regarding both these safeguards will be furnished promptly on request.

*Patented, other patents pending.
**Patents pending.

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Oil Industry Department

Mention Where You Saw the Advertisement

DEALING IN PERSONALITIES

Whenever as many as two men meet to consider some movement for the welfare of the natural gasoline industry chances are something like ninety-nine to one that D. E. Buchanan will be one of the men.

He has admitted being present when a few men met one day to eat lunch at the Y. W. C. A. cafateria in Tulsa. Out of that lunch and the attendant conversation grew the Association of Natural Gasoline Manufacturers. If he has missed one of its gatherings formal, informal, called, scheduled or otherwise occasioned, none of his friends can remember it.

Certainly he has never failed to lend his weight to any load when called upon for help.

Neither does natural gasoline, which is both his vocation and his avocation, claim all his time. He takes a hand in the affairs of the Western Petroluem Refiners Association. He is on the committee recently named to work out means of forming an export corporation for independent Mid-Continent refiners.

Besides his activities within the petroleum industry, he is a willing worker when some civic cause needs either a leader or a private.

Now in case there may be a few not acquainted with his business activities, it can be set down that he is a vice-president of the Chestnut & Smith Corporation, Inc. Just how he finds time to accomplish what he does for associations related to the industry and affairs of civic nature and still maintain a clean desk at his office is almost enough to make a man believe in the elasticity of time. Withal he never seems hurried. He has a minute or an hour for any good cause, or for a friend. When called upon he never pleads business.

Buchanan came into the oil industry on the railroad track. If his friends have his carrer correctly outlined, he once worked for a railroad company at DeRidder, Louisiana. Then he worked for another at Sapulpa, Oklahoma. Perhaps he worked for other rail concerns at other places between these two connections.

Anyway the oil industry called during the stirring days of Burkburnett and he enlisted. Sometime afterward he joined the Chestnut & Smith organization and was sales manager before he became vice-president.

It is not giving away any secret to say that he smokes numerous good cigars.

At the last banquet of the Association of Natural Gasoline Manufacturers, he was designated as a "diplomat." James A. Veasey, counsel of the Carter Oil Company and toastmaster for the evening, did the designating.

D. E. BUCHANAN

Veasey told this story to illustrate the qualifications of a diplomat. In a certain family it was the habit for the pet dog to occupy a share of the bed while the wife slept and the husband continued his efforts to match another ace to one in the hole.

The husband, coming home so late he knew he would receive a tongue lashing, entered his home through a basement window, dressed for bed without disturbing his wife and was about to gain his place in bed undetected when his wife said, "lie down Fido."

The man had the presence of mind to lick her hand and all was well.

That according to Mr. Veasey offered an example of practical diplomacy. He told the story by way of introducing Mr. Buchanan, who arose and said:

"If I had been in that man's place, I should have slept in the basement."

That is diplomacy, too. It also illustrates the fact that D. E. Buchanan can make a brief speech, which may be one reason he is in demand for banquet purposes.

Bird Cross, operator at 19-G Plant of the Standard Gasoline Company, at Taft, California, unofficially broke all records for the standing high jump when he almost stepped on a good-sized rattlesnake as he rounded the corner of the boiler house.

W. M. Houser, witnessing the incident from a distance, says that the snake gave a long rattle, and Bird jumped on top of the boiler house!

Anyway, there must be something to the story, for Bird exhibited twelve rattles and a button to support it.

William H. Staebner has recently joined the information department of Arthur D. Little, Inc., chemists, engineers and managers, of Cambridge, Massachusetts, where he will take charge of their special petroleum library.

Waterbury, Conn. — The Bristol Company, manufacturers of recording pressure gauges, thermometers and Pyrometers, have recently announced the opening of a branch sales and service office in the U. S. National Bank Building, Denver Colorado. H. T. Weeks has been placed in charge of the new office.

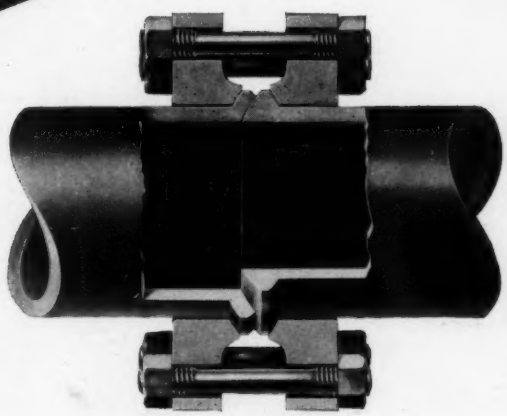
Oscar J. Berend has resigned as head of the gas contract division of the Skelly Oil Company.

Dobbs Units for Paragon

Toledo, Ohio.—Two 1000-barrel units of Dubbs cracking process are being installed by the Paragon Refining Company here, being part of a general improvement and enlargement program under way.

Other work includes a gas recovery and absorption plant, a continuous treating unit and a new system of bubble towers.

7310



were installed by Refiners

VERY good reasons must exist for such wide acceptance and use of Midwest Joints among the refiners of the country. And present indications are that the number of Midwest Joints placed in refinery service during the last half of this year will far exceed the figure for the first six months.

Midwest Joints are used principally upon piping for cracking units operating at pressures from 200 to 500 pounds and with temperatures ranging from 700° to 1000° Fahrenheit. Refiners are now also using them on hot oil lines regardless of pressure—wherever there is danger of a leak, flash and fire. Another important application is upon high pressure steam lines.

Midwest Joints require no gaskets—there is nothing to blow out and cause a flash and fire with its frequent expensive and disastrous consequences.

Erection of piping is greatly simplified when it is provided with Midwest Joints—because their contact surfaces are spherical and the piping need not be in perfect alignment. Deflections to 3° are possible.

These are simply a few of the many advantages that Midwest Joints have for the Refiner. We shall be glad to send you complete information and performance data without obligation.

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Fabricators of Oil Refinery, Natural Gasoline Plant and Power Piping

MIDWEST Joints and Piping

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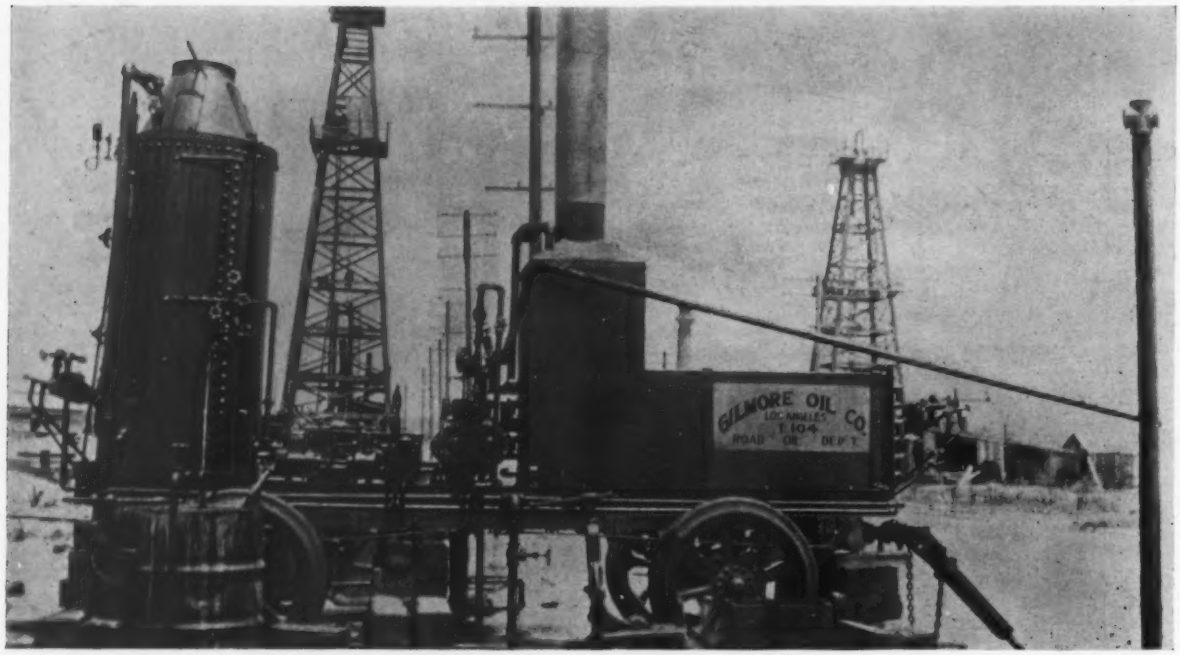

Gilmore portable road oil retort for heating

Portable Retort Solves Road Oil Heating

THE distribution of asphaltic road oils used in the preparation of Macadamized highways is usually attended by the problem of maintaining temperatures in the oil high enough, or hot enough, to assure fluidity when spreading the material on the road bed. Road oils, as a rule, are marketed in accordance with certain specifications as to asphalt content. General practice in California, where many highways are macadamized, requires that road oil contain 90 to 95 per cent of 80 penetration asphalt, this to assure that the material will penetrate the aggregate (material employed to form the road bed) sufficiently, and to assure a partial solidification after the oil cools; the oil after cooling must not remain soft. Oil of this type and meeting requirements must, naturally, be handled at relatively high temperatures or such oils will not flow from the spreading machine, nor will they spread over and penetrate the road bed aggregate. In practice the road oils are usually spread on the highway undergoing construction at a temperature of 400 to 450 deg. F. Securing and maintaining this temperature constitutes one of the chief problems of the road oil marketers.

Often the scene of actual employment of the oil is many miles from the source of supply of the material. Again, the road oil is employed some miles from the nearest railroad or town necessitating in some cases, very long hauls in tank trucks transferring the hot oil to the scene of activity. While it is true that the oils are loaded at the refinery or road oil plant at temperatures sufficiently high to assure their easy removal from the cars, and usually the cars are of the insulated variety, still it is seldom that a tank car of oil can be unloaded and spread on the road without reheating it to the proper temperature. It is usually necessary to heat the oil to partial fluidity by means of the steam coils in the tank car, and then to further heat the oil to about 500 deg. F. in some type of special apparatus in order to insure the proper temperature in the tank truck at the point of delivery.

The Gilmore Oil Company, with one road oil plant at Santa Maria, Calif., another at Hollywood, and a third at Vernon, California, have often, in the past years, been confronted with the problem of re-heating cooled road oil when the material was spotted on some out of the way switch, or spur, where no equipment for reheating was provided. Such conditions might easily involve the return of the car to the nearest hot oil plant for heating and the additional expense of replacing the material with another car. With the view of eliminating the possibility of such conditions, and with the idea in mind of securing the high temperatures required at the nearest point to the scene of actual use of the road oil, W. C. Minger, Superintendent of Refineries for the Gilmore company, designed and had constructed the first of the Gilmore portable road oil retorts.

This small, compact, and efficient heating plant, mounted on a Hercules Trailer, is complete in every detail. The trailer is used as mounting in order that the truck accompanying the portable plant can be used either to haul hot road oil to the point of spreading, or to haul fuel oil to the retort for heating purposes. The heating plant complete is shown in the accompanying illustration. In this location, at Newport Beach, California, the plant is supplied with natural gas for fuel, and with city water for conversion into steam. The location is made a few feet away from the company tank car "spot"—the cars containing cooled road oil. The heating plant consists of a full set of equipment for both heating the oil in the oil or gas fired retort, and for partial heating of the oil in the tank car by means of steam in enclosed coils in the car. At the end of the trailer is mounted the vertical type, 5 horsepower boiler (Orr and Semblower) 6 feet in height and and 36 inches in diameter. The boiler, and the oil heating retort on the other end of the trailer, is fired through a Volz Low Pressure gas and oil carbureter type of burner—which is adjusted and controlled by a needle valve device. The water is injected into the boiler by a Pemberthy injector through a ½-inch line. In addition to the injector a small steam pump is

Corrosion Resisting SERVICE

OPERATORS have learned that every process in their plant in which corrosion or erosion are factors demands the use of alloys of guaranteed physical charcteristics. They know the wisdom of buying alloys on the basis of "ultimate safety and economy," rather than on such open specifications as "phosphor bronze," manganese bronze," etc. Quite naturally they look to Hills-McCanna for Alloys to meet their requirements satisfactoriy.

Hills-McCanna Alloys are "time tested" Alloys. Wherever you see a product marked "Hills-McCanna," whether it be a valve, a pump part, a pyrometer protection tube, a thermometer well, a fitting, liner, piston-ring, gear, or bushing, you may know that it has submitted itself to a gruelling test on the job before it was adopted for that particular service. We acknowledge their limitations in certain elements and recommend and encourage their use only where service tests have proved that long life will result.

Hills-McCanna Alloys and Chemical Pumps ARE dependable. Our experience as founders of non-ferrous alloys since 1870 has taught us to make them so. And Industry has learned by actual use of our products for 56 years that Hills-McCanna renders REAL Corrosion Resisting Service.

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Francis R. Glenner, 53 Park Place, Room 704, New York City

NON-FERROUS ALLOYS - CHEMICAL PUMPS
FORCE FEED LUBRICATORS

Mention Where You Saw the Advertisement

placed just back of the boiler, size 3x2x3 inches, Worthington pump.

Just opposite this small steam pump, and also back of the boiler the tool box is fastened to the framework of the trailer, in size about 2x3 feet. This box contains all of the tools necessary for any small repair job and an assortment of small fittings and repair parts. In addition, there is a complete first-aid kit provided for use in case of accident.

Behind the tool box and boiler water pump, at about the middle of the trailer and placed across the framework, securely bolted in place, is a Worthington 6x4x6 inch steam pump. This pump is used to circulate the oil to be heated from the car to the retort and back again into the car—when circulating to raise the temperature of the oil—and to load the heated oil into the tank trucks for delivery.

Next to the larger pump and at the other end of the trailer is the retort. This equipment consists of a double walled, insulated steel furnace box, in which there are 18 tubes, 9 feet in length, of 1½ inches in diameter. In addition to these horizontal tubes, there is a coil of the same diameter or size of pipe in the square section just under the smoke stack, and the total length of the heating coil is a little over 200 lineal feet. The furnace is equipped with a small brick arch, and is fired through a Volz burner of the same type and size as employed under the boiler. The oil leaves the pump through a 1½-inch discharge line, enters the heating coil at the top, under the stack, to flow downward toward the zone of highest temperature, leaving the retort at the bottom of the coil, from where it is either conducted to the loading tank truck or back to the tank car. It is often necessary to circulate a car of oil for two or three hours before it is ready for loading in the distributing trucks.

The heat interchange principle works to advantage in this installation, the large oil pump gets its suction from the tank car through a three inch suction line. Inside of this three inch line there is a one inch steam line, through which steam is passing to the coils inside of the road oil car. The pumps and all lines are also manifolded in such a manner that when the work is done, steam can be released into all lines to blow them out and clean them of the remaining heavy oil. In addition, steam is used to heat up the equipment before attempting to pass the heavy oil through it.

The auxiliaries, such as lines, fittings, etc., and including a couple of fire extinguishers, are moved with the retort outfit whenever it becomes necessary to change the location to some point near the spreading of the road oil. The truck which handles the trailer, moving it from one location to another, also moves the suction lines, steam lines, and all other equipment, to the new location. Usually about one day is required to hook up the retort in a new position or location. The portable work bench, or vice rack, shown just in front of the portable retort outfit in Fig. 1, is part of the standard equipment, and was also designed, in so far as the three, keyed legs, and vice base are concerned, by the superintendent.

New Lesson From an Old Hazard

(Continued from page 52.)

greatest regularity and whose duties obviously impressed them as serious and important. I woud also be remiss if I did not pay tribute to Mr. Lewis. I have been in consultation with many owners of property over a long period of years on the subject of fire prevention, but never in by experience have I received such hearty co-operation as Mr. Lewis accorded to this topic and the improvements which he has brought about in the Conewango Refining Company's property are so outstanding, that I feel it both my duty and privilege to refer to the same here. In Bulletins from this Association your attention has been directed from time to time to the advisability of organizing a fire brigade. Two corporations apparently only have responded. The fire brigade organized by the Conewango shows such thought and care in its organization, that I trust Mr. Lewis will describe it to you to the end that others may adopt his plan. Give a man a badge and certain regular duties to perform and he will unquestionably devote his attention more diligently thereto than if he is only called upon in an emergency. Whether you have a Fire Marshal or not, bear in mind that if you have a fire brigade you thus really multiply the number of those whose minds are constantly dwelling upon the causes of fire and their prevention.

I feel that I have failed in giving you anything new, but if I have been able to present to you old thoughts in a new fashion so that the roster of the Fire Marshals' Association will promptly be increased, and the scope and importance of the work of a Fire Marshal has been more thoroughly impressed upon you, then my mission here has been served.

Automatic Vapor Recovery System for Richfield Co.

J. A. Campbell, natural gas engineer, Long Beach, Calif., has recently completed the installation of a vapor recovery system of 2000 gallons daily capacity for the Richfield Oil Company refinery at Hynes, California. The installation embraces certain newly developed principals in that it is automatically controlled throughout and functions to remove the vapors from the oil tanks connected by the gathering system as fast as they are formed as replacing dry gas wherever a vacuum is formed. Very sensitive valves are employed which automatically open or close whenever necessary either to permit the removal of accumulated vapors or to permit the influx of dry gas to take the place of the vapors removed, thus providing steady equilibrium in the tank. The pressure in the tank is controlled between the limits of 1 inch of water vacuum or pressure. The arrangement of sensitive valves under automatic control on all tanks keeps air out of the tanks thus eliminating the air mixture with oil vapors and thus adds a great deal to the safety of the mixture, tending to reduce the fire hazard.

Assuring an equilibrium within the tank, whether pumping in or out, or at all times, the sensitive and positive control of the volume of vapors present, removes the danger of either pulling a vacuum on the tank or of building up any high pressures when filling—and at the same time it is possible to keep the tank air tight at all times.

Shell Completes First Unit of Ventura Plant

The Shell Oil Company has recently completed the first unit of its absorption gasoline plant in the Ventura field, near Los Angeles, California. The company has appropriated a sum said to be close to $600,000.00 for the construction of this plant which, when finished, will be the largest installation of its kind in the world. At present the company is producing 58 million cubic feet of gas daily, and with their development program well under way they expect to be handling 100,000,000 cubic feet of gas daily through its absorption plant. As this gas yields close to one gallon per thousand cubic feet, the plant will, when completed, manufacture around 100,000 gallons of gasoline. Work is being rushed on the remaining units in order to keep abreast of the great quantity of gas produced. The plant will consist of two sets of absorbers, all of the J. A. Campbell Oil Froth type, the first series of which will handle the gas at the usual or customary operating pressure, while the second series of absorbers will treat the gas a second time and at very much higher pressures. The absorbers are constructed to operate at 400 lbs pressure when employed in the second treatment of the gas.

Peep-Hole Door For Boiler Furnaces

The Springfield Boiler Company has recently perfected a new Peep-Hole Door for boiler furnaces and stills that has a number of advantages.

It is easily installed on the fire or inspection door or placed on the brickwork without necessitating any serious changes in the refractory lining.

The Peep-Hole Door consists of a square plate with a five-inch round opening and a revolving shutter having three positions.

Closed—completely closing the opening.

Inspection Position—placing a special colored glass over the opening so that true conditions within may be ascertained without glare or uncomfortable heat.

Open—allowing the insertion of steam lance or slice bar.

The new device permits a thorough inspection of furnace conditions in perfect comfort and without eye strain. It also allows working the fire without opening a large door and admitting cold air above the firebed. Its weight, packed for shipment is only 50 pounds.

The first use of gas in America 1821

Fredonia, New York, the most progressive city in America... first to use Natural Gas for street lighting. Gas lighted streets became the best selling argument for real estate. It was a factor in political campaigning. And who can gainsay that it was not one of the greatest contributions to the civilization and progress of a young and struggling nation?

Today, one century after the celebration of the municipal lighting system of Fredonia, natural gas has flashed to another epoch in the march of civilization. Now every motorist depends upon it... demands that to refined gasoline be added the proper percentage of NATURAL GASOLINE to make the perfect motor fuel.

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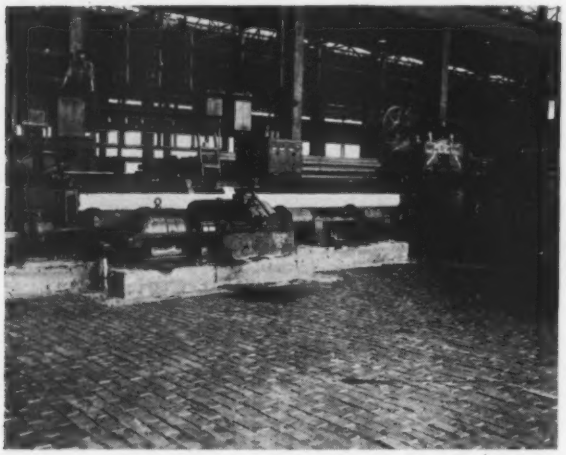
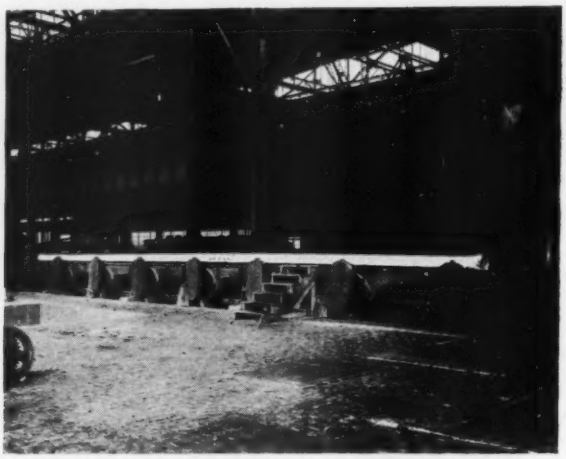


Number 13 Tube leaving sizing machine at plant of the Pittsburgh Steel Products Company



Number 8 Tube leaving Pilger Mill at plant of the Pittsburgh Steel Products Company

Pittsburgh Steel Has New Modern Tubular Mill

Pittsburgh, Pa.—Pittsburgh Steel Products Company, one of the foremost steel manufacturing concerns of America, has recently put into operation a new mill here which gives the company much additional capacity and facilitates greatly the manufacturing process.

This new mill is of the Mannesman Pilger type and is said to be the first of its kind in America. Many new features of steel manufacturing plants are incorporated and the company feels that it is the latest word in establishments of its kind.

One of the advanced developments in large tube manufacture which is a feature of this mill is the fact that it will successfully pierce a cast iron ingot, thus eliminating rolling processes between the ingot mold and the piercing mill. The ingots are cast in round molds of varying diameters to suit the requirements of the particular size of tube to be made. Bottom-casting of the ingots is employed exclusively.

A unique method is employed for cutting the ingots to the encessary lengths for piercing. The ingot is nicked on two sides, by means of an hydraulic ram; the nicking tools are then automatically removed, and the ram, continuing forward, forces the ingot against a V shaped block and breaks it through at the nicked places. This affords an excellent opportunity for the inspection of the steel in the ingot, any piping or blow holes being readily detected and that portion of the ingot containing these defects discarded. In this way an absolutely sound blank is assured, and the importance of this feature will be appreciated by those who understand the severe distortion steel is subjected to in the various operations of manufacturing seamless tubing by the piercing process, and particularly in the piercing operation.

Two continuous furnaces, with bottoms inclined just sufficiently to permit the round blanks to roll towards the front end by gravity, are used for heating the blanks preparatory to piercing. Thus, as one blank is extracted at the discharge end, another rolls into its place. In this way the blanks are heated gradually and uniformly to the proper temperature. At the extreme point of discharge, the floor declines sharply, so that the blank rolls out of the furnace onto a roll conveyor and thence to the feed trough of the piercing mill. Two furnaces are necessary on this mill in order to keep the piercing mill supplied with properly heated blanks, the latter being taken from the furnaces alternately. These furnaces are 70 feet long by 10 wide, and are fired with natural gas.

The piercing mill is of the Mannesman or roll type and is of heavy and rugged construction to stand up under the severe service entailed in piercing large ingots. This mill is driven by a 2250 horsepower motor.

Leaving the piercing mill, the pierced ingot presents the appearance of a short, rough tube, with extremely heavy walls. It now travels, without reheating, to a conveyor which places it in the trough of one of the two Pilger mills. Here it is placed on a mandrel, which consists of a long, solid round steel bar of the same diameter as it is desired to make the inside diameter of the tube. This mandrel is carried on the forward end of a plunger working in a pneumatic cylinder which in turn operates in a large hydraulic cylinder and might be likened to a cross-head. The hydraulic ram thus formed moves slowly but steadily forward through the rolls.

The Pilger mill, while having rolls with parallel axes mounted and operated the same as an ordinary rolling mill, differs from the latter in that the process is that of forging or kneading rather than rolling one, as the term "rolling" is usually understood. The rolls are so designed that the pass is cut away through a part of its circumference, with the result that with each revolution, the portion not cut away strikes the tube a definite and severe blow, and due to the fact that the direction of rotation of the rolls is against the tube rather than with it, (as is the case in ordinary rolling), the tube is thrown back and cut from between the rolls.

The forging action of the rolls driving the tube backward, causes the air to compress in the pneumatic cylinder, but as the rolls revolve and again bring their cut out sections into the tube space, this compressed air forces the plunger, carrying the mandrel and tube, forward again for the next stroke of the rolls. Thus the air acts as a spring, taking up the effect of the blows but continually forcing the tube forward for the succeeding blows. A mechanical device rotates the mandrel

In the times of low kerosene prices a refiner should be able to increase his gasoline yield three to ten per cent at the expense of his kerosene.

But he should at all times be able to recover all the kerosene from the gas oil.

If the initial boiling point of the gas oil is less than five hundred degrees Fahrenheit kerosene is being sold as gas oil.

Winkler and Koch are offering to the refining industry bubble decks which can be installed in existing tower shells.

These towers will then produce maximum yields of gasoline or kerosene in one operation without any rerunning whatsoever.

The increased yields resulting represent a handsome return on the investment although the saving in fuel consumption and the increased capacity alone will charge off the expenditure in a remarkably short length of time.

The kerosene taken off these bubble towers is a superior product as regards both color and endpoint.

The fact that Winkler and Koch have supplied over one hundred bubble columns in the past few months which in a great many cases were repeat orders is ample testimony to their fractionating efficiency, ease of operation, and ability to withstand the severe corrosive conditions sometimes encountered.

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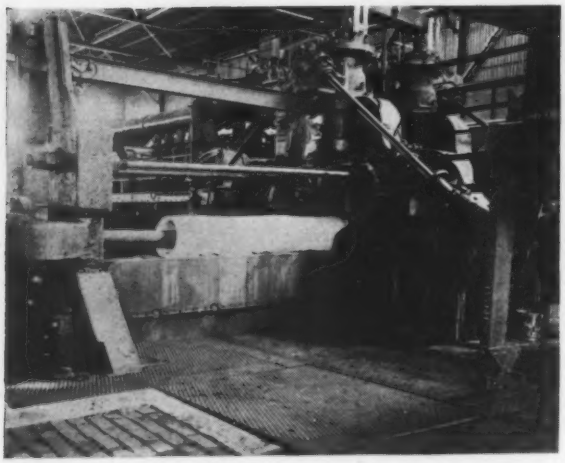
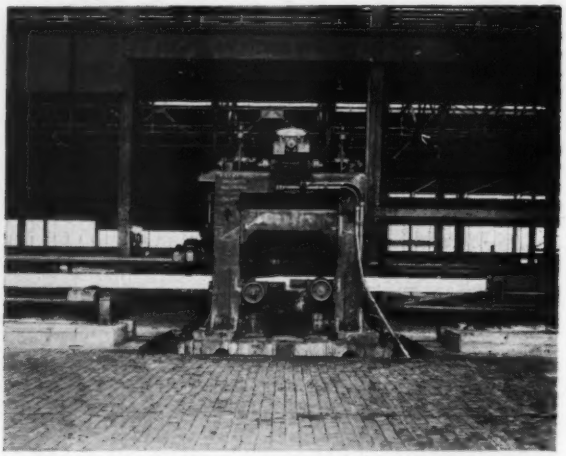


Number 5 Hollow Billet leaving piercing mill at plant of the Pittsburgh Steel Products Company



Number 14 Tube passing through cross-rolls at the plant of the Pittsburgh Steel Products Company

and tube 90 degrees between each forging blow of the rolls.

The tube thus progresses through the roll, coming out at the opposite side of the mill a practically finished tube, insofar as size and wall thickness are concerned. A mechanical device at the rolls is then brought into play which holds the tube stationary while the mandrel is withdrawn. The mandrel is then dropped into a tank of water to cool it off, and another mandrel is placed on the end of the plunger, ready for the next tube. Meantime the tube is conveyed beyond the rolls to a hot-saw, where the crop ends are sawed off.

It might be noted here that two Pilger or rolling mills are necessary to take care of the product of the one piercing mill on account of the longer time required to forge the tube than to pierce the ingot or roll a tube in the ordinary manner. These two mills are driven by a 2000 horsepower motor. The achievement of employing the principle of forging to a large seamless tube is a notable development, and produces the fine and uniform texture of steel that is a characteristic of forged steel.

From this point the equipment of the mill is so arranged that the tube can either be passed into a furnace, reheated and given a reeling operation, or, omitting the reheating and reeling, passed through the sizing mill and cross rolls, depending upon the nature of surface finish. While certain classes of tubing require a high finish, there are other classes which are to be subsequently reshaped and worked which do not require the high finish imparted by the reeling operation, so the tubes in this class can be by-passed around the reheating furnaces and reeling machine and put through the sizing mill and cross-rolls on the same heat as they come from the Pilger mill.

The reheating furnace referred to above is long enough to accommodate a tube 50 feet in length and is fired with natural gas. The tube enters it lengthwise at one side, on water cooled rollers, and then slowly rolls to the other side, during which time it is uniformly heated to the required temperature; when it reaches the opposite side it travels through the discharge door onto a conveyor which carries it to the reeling machine.

This reeling machine consists of a pair of short heavy rolls of special design set in housings, which lie side by side, with their axes inclined slightly to the horizontal and in opposite directions, crossing each other at a corresponding angle in the middle of their length.

A mandrel is pushed into the space between the rolls and the hot tube is pushed in over the mandrel. Both rolls revolving in the same direction, start the tube and mandrel revolving also, and the tube is slowly drawn over the mandrel, leaving the mill practically straight and perfectly round, with a highly burnished surface, but slightly over size. The mandrel consists of a water cooled hollow bar or tube.

The tube is then conveyed to the sizing mill, which consists of two horizontal rolls grooved to form a perfect round of the exact outside diameter of the tube desired. The tube being slightly oversize, as stated above, the sizing rolls compress and elongate it to an exact outside diameter. No mandrel is used in this operation.

The tube is then conveyed to and passes through a pair of cross-rolls for the purpose of removing any waves or kinks, and when it leaves these rolls it is commercially straight.

From the cross-rolls the tube is mechanically lifted onto a long inclined cooling table, up which it travels at a slow rate of speed by means of endless chains.

When cold the tubes are inspected and sorted, then transferred by electric cranes to various cut-off and threading machines for the finishing operations. The arrangement of this plant is such that the material is continuously moving in one direction, towards the finishing department.

The latter department is equipped with modern cut-off machines of ample size to take care of any size and quantity the mill is capable of producing, together with threading machines for pipe and couplings, straightening machines, hydrostatic test benches and other machines of special design for the finishing of the tubes.

The entire mill is driven by electrical power from a central power plant at Allenport and the electrical equipment includes 152 motors, totaling 10,000 horsepower, three generators, two exciters, and eight traveling cranes ranging from 7½ to 20 tons capacity.

The capacity of this mill is 300 tons each 24 hours, and its principal product is oil country tubular goods, although a considerable tonnage of other classes of large diameter tubing has been booked since the mill went into production.

The Pittsburgh Steel Praducts Company is a subsidiary of Pittsburgh Sttel Company and has its own plants at Monessen, Pa., and Allenport, Pa., in the Pittsburgh district.

Olympic Using Ryan Process

Long Beach, Calif.—The Olympic Refining Company here operating a 5000 barrel skimming plant employing the Ryan process which is especially adapted to the treatment of oils of considerable sulphur content, recently started the construction of a 500 barrel cracking plant. The Olympic Company is owned by C. P. Ritter, president, of Riverside, California, H. F. Alexander, Stanley Dollar (Dollar Steamship Company) and others. E. A. Wyatt is general manager for the company at Long Beach. H. H. Rathvon, refinery superintendent.

The cracking units under construction consist of three retorts and expansion drums operating under the vapor phase methods in conjunction with redistillation and fractionating apparatus. The National Refining Process Corporation, Hibernian Building, Los Angeles, control the process patents and are licensors of the process. Mr. Geo. C. Peckham is president and general manager of the latter company.

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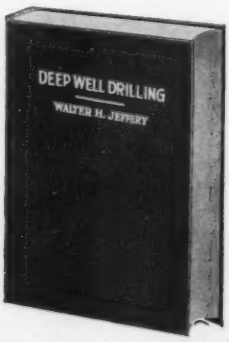

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EXTRACTS OF REFINING TECHNOLOGY

Action of Ozone on Saturated Hydrocarbons or Petroleum—By the action of ozonized oxygen containing about five per cent of ozone on a fraction, boiling point 150 to 300 degrees, mainly saturated hydrocarbons, of Kurokawa petroleum, the iodine and the acid values, specific gravity, refractive index, and viscosity increased to an extent depending on the time of the treatment while the rotatory power decreased. In the case of liquid paraffine the acid value, specific gravity and viscosity increased slightly, while the rotatory power decreased and the iodine number ond refractive index were not influenced by the treatment with ozonized oxygen. Journal of the Societyof Chemical Industry of Japan, 1926, volume 29, pages 7 to 12.

* * *

Testing Oils of Transformers Switches and Turbines.—A review of the most important method for testing the suitability of a mineral oil for use as an electrical insulator is given in Zeitschrift fuer angewandte Chemie, 1926, volume 39, pages 473 to 475. In this article it was pointed out that unsatisfactory results are given by most methods and the need for further research to discover the reason why the insulating power of certain oils breaks down more quickly than that of others was emphasized. Comparable results of the amount of tarry matter formed by the oxidation of the oil are not obtained by any of the present methods, sodium peroxide, exposure to air at a temperature of 120 degrees C. and bubbling air through the oil at a temperature of 120 degrees C. Furthermore considerable difference of opinion exists as to the value of the method which involves agitation with the admixture of sulphuric acid.

* * *

Emulsified Solid Greases.—An emulsified solid grease, containing about fifty per cent of water, particularly suitable for lubricating the axles of trucks, etc., inasmuch as its consistency is maintained irrespective of the change in temperature, is obtained in accordance with British Patent No. 232,259, by subjecting lubricating oil to a preliminary treatment by electric glow discharges before adding the water. No soap or soap-forming sugstance is used.

* * *

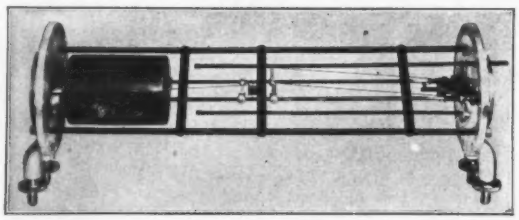
Determining the Flash Point of Machine and Cylinder Oils.—Results usually obtained in the laboratory on this important property of oils vary at times between fifteen and twenty degrees, an accuracy of five degrees being considered as satisfactory. In the original article on this subject container in Teer und Erdoel, 1926, pages 443-4, a description is given of the Holde method of determining the flash temperature. Criticism is made of this method from varicus standpoints. Thus it is stated that the variation in the case of very heavy oils was found to be as high as ten to fifteen degrees. Furthermore a great difference was observed when the igniting flame was fed to the containing vessel in a horizontal and in a vertical direction, and the flash temperature was higher in the first than in the second case.

It was also fcund that the variations of the individual readings of one and the same oil was much less when the igniting flame was vertical than when it was horizontal. This must be evident without further explanation. The rising vapors and the stream of heat emitted by the vessel containing the oil give rise to air current above the crucible. The composition of the air-oil vapor is accordingly more variable outside of the edge of the crucible than within the crucible walls. This means then that when the igniting flame is held at a point from two to three millimeters above the edge of the crucible, more variable results will be obtained than when the flame is held within the crucible.

A point which is of particular importance in the determination of the flash point of oils and which has not been given the attention that it deserves, is the depth to which the ther-

THE "R S" NICK OF TIME PRECISION S. G. BALANCE

Patent Applied For



Improved type of strictly portable and accurate Balance. THIS MACHINE IS BALANCED INSIDE THE CASE WITHOUT REMOVAL OF BALANCE MECHANISM. The Float is of pressed steel construction, the entire apparatus is lacquered inside and out to prevent corrosion except the Torsion Spring and Truss Wires which are Gold Plated to withstand acid reactions.

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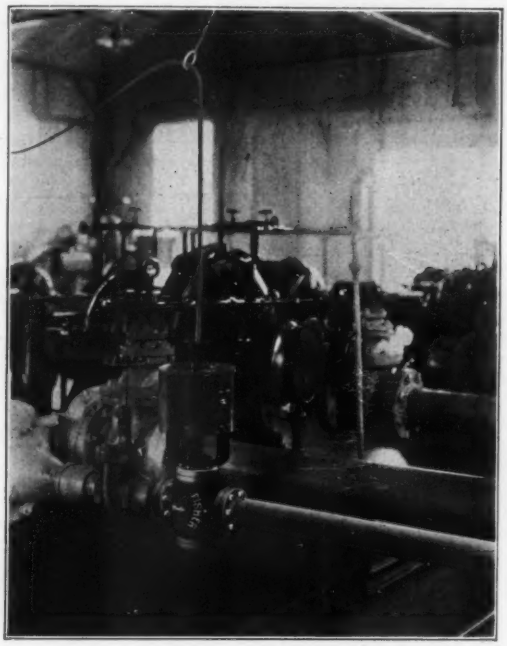

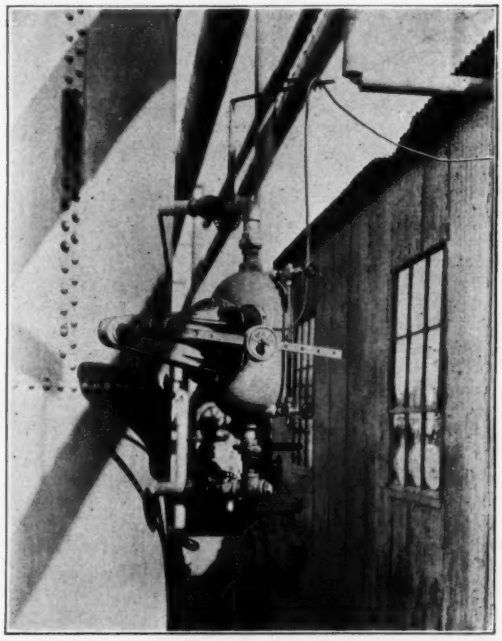

Showing the Fisher Liquid Level Remote Control, Type 240, installed at the Carter Oil Company Plant, Cromwell, Okla.

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mometer dips into the mass of oil. An investigation was made to determine the effect of dipping the thermometer to various depths in the oil, and the results are given in the following.

Distance of lowest point of thermometer from the bottom of the crucible.	Masurement I.	Masurement II.	Temp. rise in deg. per minute
Oil A.			
1 millimeter	286	287	4 to 5
5 millimeters	277	278	4 to 5
10 millimeters	277	278	4 to 5
15 millimeters	275	276	4 to 5
Oil B.			
1 millimeter	298	297	5
2 millimeters	293	294	4
5 millimeters	287	286	6
8 millimeters	285	286	5
-5 millimeters	287	285	3

The figures indicate that the depth to which the thermometer is inserted into the oil is an important factor in the determination of the flash temperature. When the separating distance is between five and fifteen millimeters, constant values for the flash point are obtained. The values then differ only from two to three degrees C.

The general conclusion that can be reached from this investigation is that more constant figures are obtained for the flash point of oils when the igniting flame is vertical in the place of horizontal, and that a proper distance should separate the end of the thermometer and the bottom of the crucible containing the oil, if constant and accurate results are to be obtained.

* * *

Removal of Carbon in Oil Cracking.—A noval method of removing the carbon that is produced during the cracking of petroleum oils, is described in British Patent No. 248,232.

The carbon is removed from the reaction vessels by enclosing in the vessel a flexible metal chain or cable which, on withdrawal, breaks up the carbon deposit. In the accompanying figure the reaction vessel 14 receives oil heated in a pipe still 1 and discharges vapors to a dephlegmator 9, down which fresh oil passes from a pipe 10, and the reflux from which passes to the still 1. Within the reaction vessel 14 a flexible chain or cable 24 is tied to hooks 2 and 3 on the interior of the vessel, and to supporting wires 26 passing across the vessel to form a series of flat helices. The free end 27 of the cable rests on the plate 16 closing the outlet.

When carbon is to be withdrawn the cable is pulled through the outlet opening, the ties being successively broken. A second cable may be tied inside a cage formed of rods supported vertically on the chamber and adapted to be withdrawn through the outlet after the cable has been withdrawn so as to form a central vertical opening through the bed of carbon. Alternatively the cable may be tied anternately to hooks at the top and bottom of the chamber so as to lie in vertical lengths along the side walls.

* * *

New Process for Making High Grade Mineral Oils.—A new process for the manufacture of high grade mineral oils, particularly transformer and turbine oils, is described in Petroleum Zeitschrift, volume 22, pages 576 to 578.

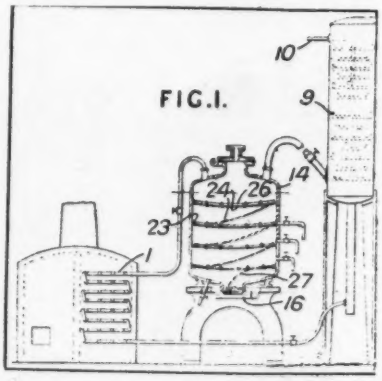

FIG. 1.

The new process has been devised to get rid of the difficulties that surround the usual process of making these high grade products and which consist in the use of sulphuric acid. This process depends on the precipitation of the

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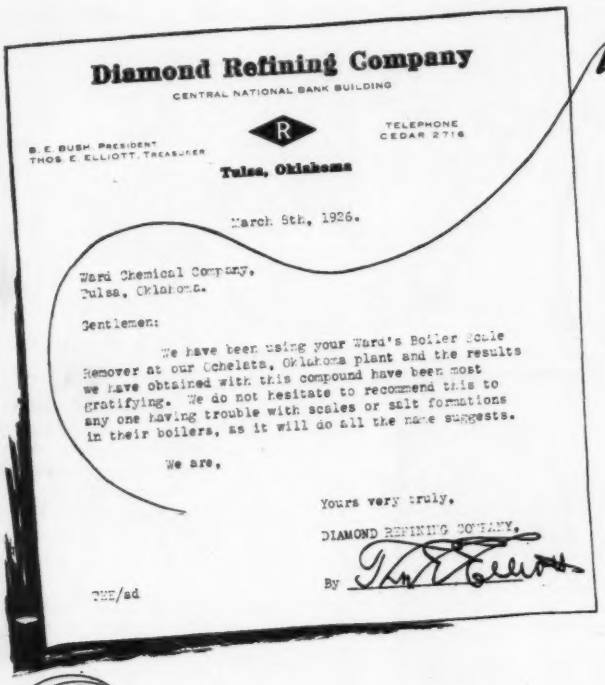

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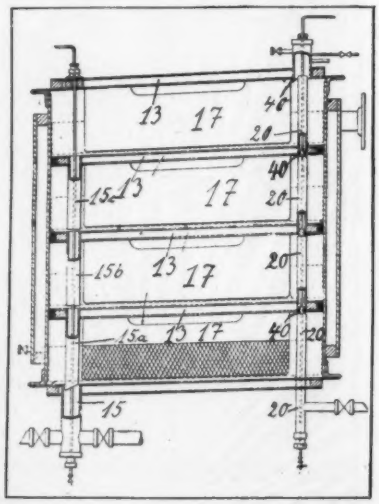
impurities that are contained in the crude material in the chemically unchanged condition. Under certain experimental conditions it was found possible to have soaps of various sorts absorb from the mineral oils those ingredients or oil constituents which are easy to emulsify. In this way it is possible to precipitate these substances along with the soaps by the addition of an excess of alkali to form a viscous, darkly colored mass. Details are given in the original article regarding this method.

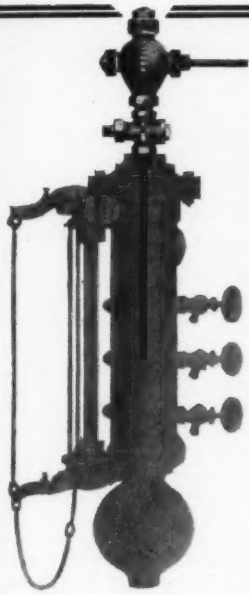
Causes of Changes in Lubricating and Insulating Oils During Use.—In the use of lubricating oils the action of oxygen and polymerization are held to be the causes of the deterioration and aging of the oil. Catalysts and temperature and moisture as well must have the effect of heightening the action of oxygen. The catalyst which is present almost all the time is iron, which is known to have a strong action in organic changes.

The slime that was obtained from a turbine oil which was subjected to the action of oxygen in the presence of catlysts contained considerable amounts of an iron salt which was soluble in acetone, and the residue that remained after the decomposition of the slime in water and oil consisted of coarse impurities, such as glass, wood and the like. In the water that was precipitated from the slimy mass it was possible to detect compounds of tin, copper, iron and zinc with the fatty acids, and in addition thereto sulphuric acid was also present in the combined state. The slime obtained from a transformer oil contained considerable quantities of tin acetate in addition to salts of several of the higher fatty acids. Observations which have been made on cylinder oil have indicated that iron oxide acts as oxygen-carriers. Braunkohle, volume 25, pages 61-66.

* * *

Crystallization and Sweating-out of Paraffine.—The apparatus which is shown in the accompanying illustration





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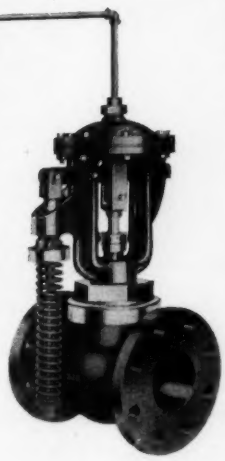

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is used for the purpose of crystallizing and sweating out paraffine. This apparatus consists of one or as many as desirable horizontal wax chambers which are arranged one over the other and which are closed to the entrance of air. These chambers are shown at 17 in the figure and these chambers are surrounded on top and bottom with heating or cooling jackets shown at 13. At the sides of these chambers are the inlet and outlet tubes, shown at 15a, 15b and 15c. On the other sides are located the air pipes which suck air from the chambers and so place the them under a vacuum. These are shown at 20.

The apparatus is patented in German Patent No. 426 880.

Modern Stills

(Continued from page 37)

noted that this unit can be run at any capacity within reason under the maximum for which it was designed. The circulating pump will maintain the necessary velocity and the throughput is then controlled by the intensity of firing.

The above outlines modern practice. I could go on at length discussing the details of the design of stills, exchangers, towers and auxiliary apparatus, but it would lead to technicalities of principally academic interest which can better be left to the technical journals.

Before leaving the subject of stills, I wish to touch upon a subject that has been broached before in your meetings, and that is the advantages of superheated steam in the stills. Do you realize that on a battery of the fair efficiency of 40 per cent superheating the steam will save some 10 per cent of the fuel? You now use your stills as steam superheaters. Why not use waste heat? Then you will find further about 15 per cent increase in capacity. The oil does not have to be subjected to heat so long hence there will be better quality and yield of heavy products. The last statements are based on observations of five plants using superheated steam and while it may be theory it is theory that has been checked in practice.

You are probably thinking that all of this talk does not apply to your plant. You have some fairly good stills and cannot afford to write them off and go into these new types of equipment. What I wish to emphasize is the fact that very often old equipment can be rearranged and added to so as to accomplish the results desired. In one case three old stills were reset, and by means of one pipe still preheater, exchangers and continuous operation 2500 barrels of oil per day is now being run with complete fractionation. In another case five old stills were connected for continuous running. In still a third case, three old cracking stills were remodeled into a continuous light oil battery of 1500 barrels daily capacity. In still another case two old steamers with their condensers were changed by means of a circulating pipe heater into a unit that will run all of the crude down to cylinder stock.

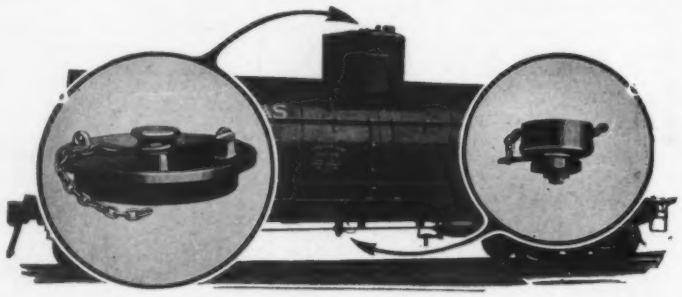
Look over your plant and see what can be utilized. You may find the change to modern methods much less expensive than you think.

I want to leave you with this thought. The large refineries have adopted modern methods. They do not re-run one barrel of oil above the absolute minimum. Their stills must show a high fuel efficiency. The small refiner must get in line.

We hear a lot about the greater divisor with its reduction of costs. Don't let it worry you. The big refinery may have the greater efficiency, but it faces another handicap. Just as soon as a plant grows to the point where the management is out of touch with the individual worker, big divisor means little. Then cooperation between departments falls down. A host of experts attaches itself to the management and further complicates the problem. Overhead costs jump. I firmly believe that the best refinery costs (I am speaking of complete plants such as yours) can be attained in a refinery of 1000 to 5000 barrels daily capacity.

I believe that the crude divisor is of decided benefit from 500 to 100 barrels per day, has little effect between 1000 and 5000 barrels per day, and begins to be a detriment over 5000 barrels per day.

So do not be concerned about the big fellow's costs. If you will use modern methods under good live management you can do as well or better and a mighty good place to start is the point where the crude oil undergoes the first process, right at the stills.



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National Petroleum Association Enjoys Prosperous Year

(Continued from page 36.)

partments; Manufacture, Trade and Commerce, Legislation and Litigation, Welfare and Insurance, Standards and Tests, Economics, Accounting and Statistics, Traffic and Transportation, and Membership and Relations.

Space doesn't permit one going into the detailed activity of each of these several departments, or the good work carried on during the past year as shown by the reports made by the trustees in charge.

Evidence of what may be accomplished by such activity, and is actually being accomplished now by the N. P. A. is the report of the Department of Manufacture on the associations newest venture, the co-operative purchase of engineering service.

Fuel Saving

H. A. Bell, a well-known combustion engineer, was procured to aid the members in combustion problems. Mr. Bell made a survey of the refineries of the members and offered expert recommendations as to the ways and means to effect saving in steam generation.

To summarize the rather phenomenal results obtained by the members of the N. P. A. in only one year by the aid of Mr. Bell, the following can be given:

Savings effected in fuel at the refineries participating ran as high as 48%. The minimum saving, on the other hand, was as high as 10%.

It was very conservatively estimated by Mr. Bell that the total saved in dollars and cents by the members of the N. P. A. during the year by better methods of firing recommended is $154,940.00. Dividing this total annual saving among the several plants, the yearly saving per refinery is $8,150.00. Looking at it in another way, the saving is $10.76 per B. H. P.

These savings came from present equipment, it ought to be mentioned. Recommendations were made, however, for the installation of new equipment in many cases to secure the maximum increased efficiency. Such recommendations are now being followed.

The estimated annual saving that could have been made by the new equipment was $320,624.00, it is believed, at a total cost of only $548,436.00 for the new equipment.

This estimated saving made possible by new equipment added to the saving effected by better firing methods gives the grand total of $475,564.00—almost half a million dollars.

There are, of course, many other phases of refinery operation which obviously would repay many times the cost of expert advice, but who would have through that attention directed at the mere generation of steam might yield such a tremendous return.

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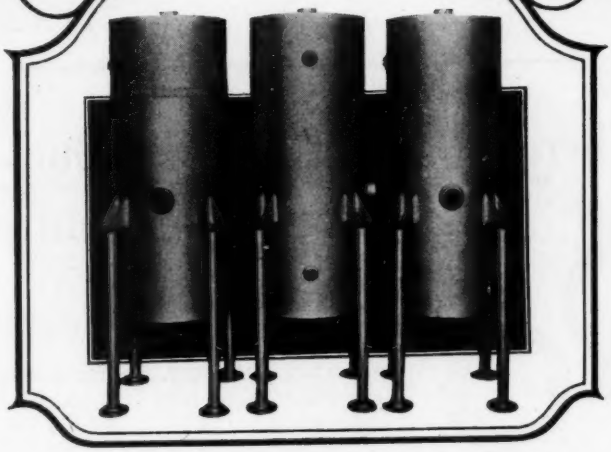

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RECENT REFINERY PATENTS

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry have been granted by the United States Patent Office:

No. 1,596,385, granted August 17 to Robert E. Wilson, Chicago, assignor to Standard Oil Company, Whiting, Ind., for an apparatus to prevent loss by evaporation from storage tanks comprising a storage tank provided with a vent and adapted to contain a volatile hydrocarbon liquid, a collapsible fabric bag substantially impervious to hydrocarbon vapors and adapted to care for ordinary changes in volume of vapor contents of the tank, a conduit connecting the vapor space of the tank to the interior of the bag, said vapor space, conduit and bag forming a vapor system, and a seal between the vapor system and the atmosphere operated on pressure differential in either direction and adapted to operate on extraordinary changes in volume of vapor contents of the tank.

No. 1,596,586, granted August 17 to Melvin De Grotte, St. Louis, assignor to Wm. S. Barnickel & Co., Webster Groves, Mo., for a process for breaking water in oil emulsions, characterized by adding a suitable demulsifying agent to such an emulsion and passing said emulsion through a bed of sand held in a treating agent consisting of an ester of a napthenic acid, and for a process for treating petroleum emulsions, characterized by subjecting the emulsion to the action of a treating agent consisting of a phenolic ester of a naphthenic solid.

No. 1,595,650, granted August 17 to Lemuel J. Husted, Los Angeles, assignor of one-half to F. L. Rounsevell, Los Angeles, for a petroleum still comprising a series of shells having a common axis, a division wall between the adjacent ends of each companion pair of said shells, said shells and said division walls secured together, the outer end of one of the end shells of said series of shells being closed, a receiving chamber spread across the end of said shell, the outer end of the opposite end shell of said series of shells being provided with a discharge chamber, a series of pipes leading from said receiving chamber to said discharge chamber, means to deliver a liquid of a high temperature to said receiving chamber and force it through said series of pipes to said discharge chamber, means to spray crude petroleum upwardly against said pipes, means to conduct the gaseous vapor therefrom, and means to drain the residuum from said shells.

No. 1,597,292, granted August 24 to Edward A. Rudigier, Baltimore, assignor to Standard Development Co. of Delaware, for a fuel oil comprising a viscous sludge from the acid treatment of hydrocarbon oils and a less viscous fuel oil having approximately the same specific gravity as said sludge.

No. 1,597,237, granted August 24 to Luther T. Arnold, Reward, Calif., for an oil dehydrator comprising a vertically disposed boiler, a fire box thereunder, an intake oil chamber in the boiler spaced from the lower end and from one side thereof to allow communication from the boiler below the chamber to the area thereabove, passage means projecting upwardly from the chamber, a chamber with which the upper ends of said passage means connect and forming an enclosure with the sides of the boiler, and an outlet from said upper chamber.

No. 1,597,399, granted August 24 to Robert E. Wilson, Chicago, assignor to Standard Oil Co., Whiting, Ind., for a method of preventing evaporation of stored liquids such as gasoline and the

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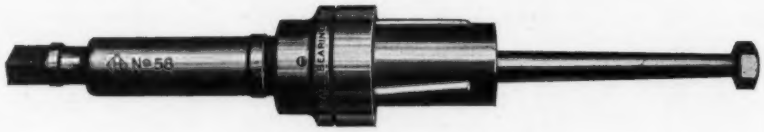

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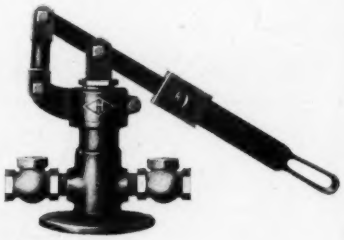

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like, which consists in inclosing the space above the exposed surface of such liquids within a flexible septum impervious to such vapors, and interposing between said septum and the atmosphere means for preventing access of moisture to the former.

No. 1,597,461, granted August 17 to Ralph A. Halloran, Berkeley, Calif., assignor to Standard Oil Co., San Francisco, for a method of dehydrating mineral oil emulsions, which comprises adding to the emulsion substantially .5 per cent per volume of a sulfonated sludge obtained from refining lamp oil distillates with firming or concentrated sulphuric acid and heating the mixture to 175 degrees F.

No. 1,597,476, granted August 24 to Carl M. Page, Chicago, assignor to George Fabyan, Geneva, Ill., for an apparatus for cracking oil by heat and pressure consisting of a multitude of closely situated vertical metallic surfaces and means surrounding them for electrically heating the same.

No. 1,597,628, granted August 24 to Nathan W. Shefferman, Washington, D. C., and Charles B. Mills, Baltimore, assignors to the Jefferson Construction and Oil Treating Co., Washington, for an apparatus for treating emulsified oils including in combination a container having an oil inlet, means for introducing solid material to said container for treating the oil, means for operating said conveyor, an agitator in said container, means interconnected with said conveyor for operating said agitator, means including a centrifuge for discharging the treated oil, and means interconnected with the aforesaid agitator operating means for operating said centrifuge.

No. 1,597,674, granted August 319 to Henry L. Doherty, New York, assignor to Doherty Research Co., New York, for a process for treating high boiling point hydrocarbons to produce lower boiling point hydrocarbons therefrom, comprising circulating oil under pressure through a heater, separating vapors from the heated oil, passing the vapors and oil through a cracking chamber while under pressure in counter-current paths, passing residue oil from the cracking chamber to an evaporator and distilling it therein by reducing the oil pressure, condensing the residue vapors by a heat interchange with untreated oil, returning the residue oil from the evaporator to the cracking chamber and condensing vapors leaving the cracking chamber; and for an oil distilling apparatus comprising a pipe still, a cracking chamber, maens for forcing oil from the pipe still into the cracking chamber, an evaporator connected with the cracking chamber, a condenser connected with the evaporator, means to conduct condensate to the pipe still, a conductor for leading oil from the evaporator back to the cracking chamber, and a condenser connected with the cracking chamber.

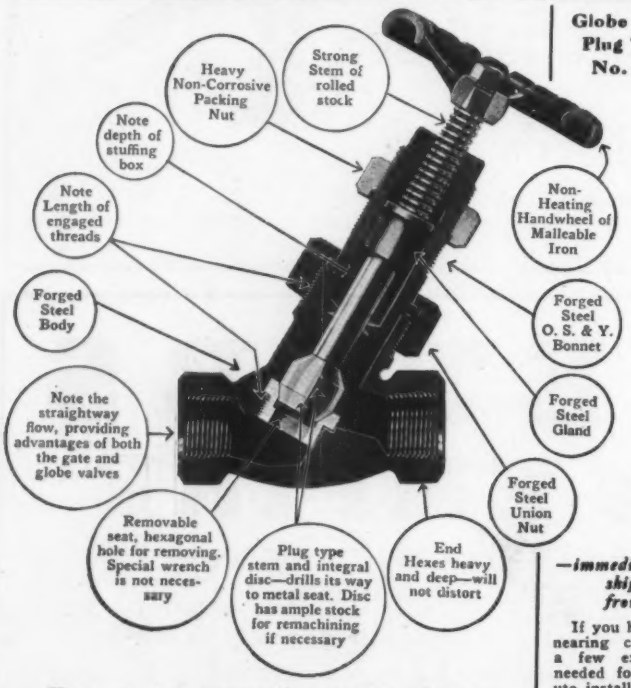
No. 1,597,695, granted August 31 to George W. Saathoff, South Orange, N. J., assignor to Doherty Research Co., New York, for a condensor apparatus which comprises a vapor compartment, cooling fluid compartments at opposite ends of said vapor compartment, cooling tubes extending through said vapor compartment from one cooling fluid compartment to the other, an intermediate chamber between each cooling fluid compartment and the vapor compartment, and means for withdrawing condensate from said vapor compartment and forcing a portion of said condensate to said intermediate chambers at a definite regulated pressure.

No. 1,597,796, granted August 31 to Joseph Hidy James, Pittsburgh, assignor to Clarence P. Byrnes, Trustee, Swickley, Pa., for a process for making low-boiling hydrocarbons from petroleum already containing artificially-introduced chemically-combined oxygen, by thermally decomposing the same.

No. 1,597,797, granted August 31 to Joseph Hidy James, Pittsburgh, assignor to Clarence P, Byrnes, trustee, Sewickley, Pa., for the partial oxidation of heavier mineral hydrocarbons by mixing a heavier fraction of a mineral hydrocarbon with a lighter fraction of a mineral hydrocarbon, vaporizing the mixture, and mixing itwith oxygen and passing the vapor mixture through a reaction zone at a temperature within the partial oxidation range.

No. 1,597,798, granted August 31 to Joseph Hidy James, Pittsburgh, assign-

Edward Forged Steel Valves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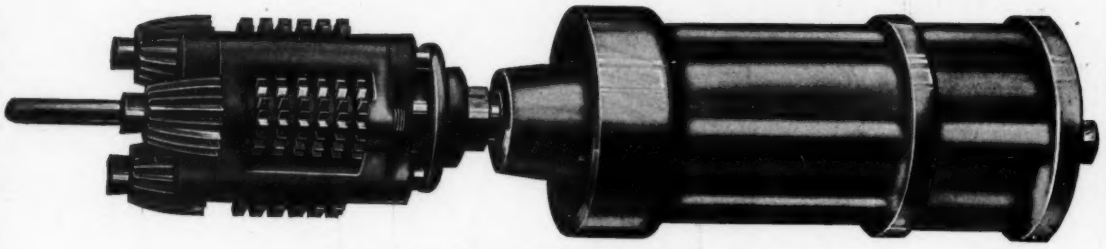

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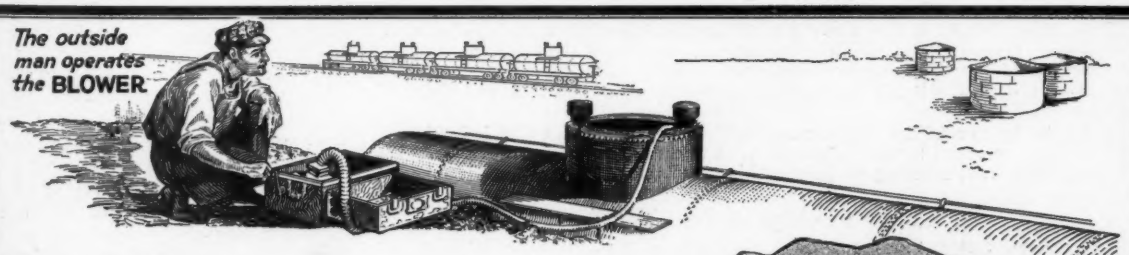

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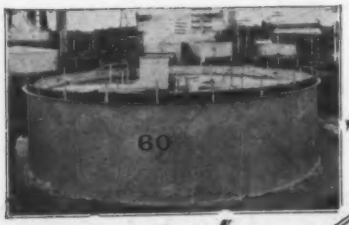
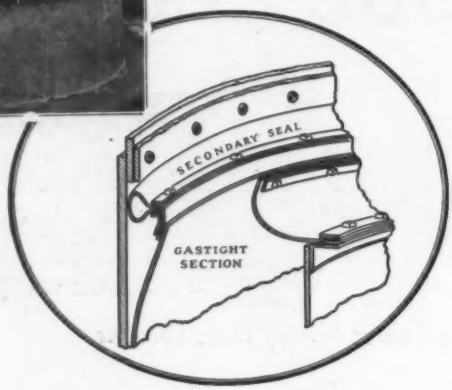


A Wiggins Roof on a rundown tank at a western refinery



A perspective view showing the double seal between the roof deck and the tank shell.

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At the bottom of the tall, narrow slot, a heavy vapor blanket is held by gravity over the small oil surface. The secondary seal keeps wind currents from entering to disturb this protective vapor blanket.

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or to Clarence P. Byrnes, trustee, Sewickley, Pa., for treating hydrocarbons which already contain artificially-introduced, chemically-combined oxygen by adding fresh hydrocarbon to the same and then htermally decomposing the mixture.

No. 1,597,821, granted August 31 to Daniel Pyzel, Piedmont, Calif., assignor to Simplex Refining Co., San Francisco, for a regulating apparatus for cracking stills comprising, in combination with a heating coil, of a reacting zone in communication therewith, a reflux condenser, means for delivering heated vapors from said reacting zone to said reflux condenser, a condensate storage receiver, means for delivering reflux condensate to said receiver, and mechanical pressure applying means acting in response to the level of condensate in said storage receiver for automatically forcing said condensate through the heating tube in a quantity varying with the level of condensate maintained in said storage receiver.

No. 1,598,136, granted August 31 to Eugene C. Herthel, Chicago, assignor to Sinclair Refining Co., Chicago, for a process of cracking higher boiling point hydrocarbon oils to form lower boiling point hydrocarbon oils which consists in subjecting a body of the oil to be cracked to distillation under super-atmospheric pressure and at a cracking temperature, maintaining said cracking temperature during the main portion of the run and effecting the vaporization under substantially undiminished pressure, feeding in fresh stock during a portion of the run in quantity sufficient to prevent the pitch formed by the cracking process exceeding the saturation point in the body of oil undergoing distillation, and continuing to feed stock and drawing off pitch-laden oil from the said body of oil during a further portion of the run in amounts conjointly regulated to prevent the proportion of pitch in the body of oil undergoing distillation rising above the saturation point in the said body of oil and in the pitch-laden oil as withdrawn.

No. 1,598,225, granted August 31 to Louis A. Walker, Franklin, Pa., assignor to The Franklin Railway Oil Co., Franklin Pa., for a solid lubricant consisting of a paraffin base cylinder stock, approximately 52 per cent, sodium stearate, approximately 4.5 per cent, free alkali, 0.5 per cent, and water, 1 per cent.

No. 1,598,254, granted August 31 to Paul W. Prutzman and Arnold D. Bennison, Los Angeles, assignors to General Petroleum Corporation, Los Angeles, for an agent for the purification of liquids by absorption, consisting of natural magnesium silicate having adsorptive porperties reduced to a finely divided condition.

No. 1,598,255, granted August 31 to Paul W. Prutzman and Arnold D. Bennison, Los Angeles, assignors to General Petroleum Corp., Los Angeles, for an agent for the purification of

liquids by adsorption, consisting of magnesium silicate which has been treated with hydrochloric acid and reduced to a finely divided condition.

No. 1,598,256, granted August 31 to Paul W. Prutzman and Arnold D. Bennison, Los Angeles, assignors to General Petroleum Corp., Los Angeles, for an agent for the purification of liquids by adsorption, consisting of magnesium silicate which has been treated with sulphuric acid and reduced to a finely divided condition.

No. 1,598,368, granted August 31 to Gustav Egloff and Harry P. Benner, Chicago, assignors to Universal Oil Products Co., Chicago, for an apparatus for cracking oil consisting, in connection with a heating coil, of an expansion chamber connected thereto, said expansion chamber taking the form of a large elongated shell and provided with a plurality of valve cantrolled residuum drawoffs and a residuum header connected to the drawoffs, and means for forcing fluid under pressure through the header to rapidly withdraw residuum from said expansion chamber.

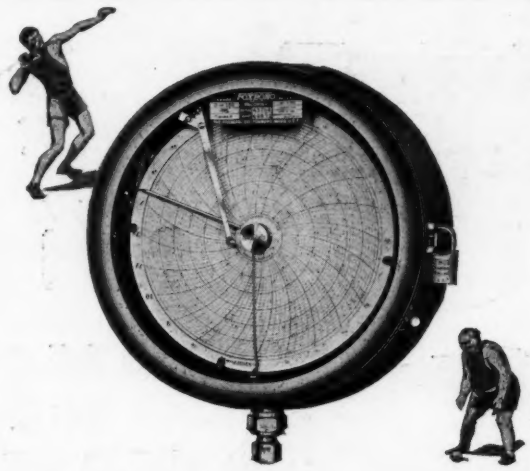
No. 1,598,618, granted Septemebr 1 to Carl M. Page, Geneva, Ill., assignor to George Fabyan, Geneva, Ill., for an apparatus for cracking oil comprising, in a heating device for the vapor space of an oil still, of two walls constituting a passage, an obstruction narrowing said passage, means for locally heating one of said walls whereby said passage is at a higer temperature at a point adjacent said obstruction, the area of said passage diminishing from the entrance thereof to the point of greatest obstruction and then abruptly enlarging to the full area of the passage.

No. 1,598,805, granted September 7 to Loftus B. Cuddy, Bayhead, N. J., for an apparatus for cracking oils consisting of a vertical still, a furnace partly enclosing the same and spaced therefrom, a baffle wall intermediate the furnace and still and forming a heating means for the furnace, said wall having a plurality of restricted openings forming the only means of communication between the furnace and the still for distributing the heat from said chamber to the still.

No. 1,598,831, granted September 7 to Milon J. Trumble, Los Angeles, Calif., for a process for recovering values from oil shale, consisting in superheating steam; partially decomposing the same to produce hydrogen; heating the shale with such steam and hydrogen; withdrawing the vapors so produced; and condensing said vapors.

No. 1,598,882, granted September 7 to Edward B. Roth, St. Louis, Mo., for a shale treating retort comprising an enclosure, an imperforate disk element supported in an inclined position in said enclosure, a number of baffles extending normally from said disk and having pockets in their sides toward the axis of said disk, means for discharging shale upon said disk, and means for rotating said disk.

No. 1,598,973, granted September 7 to George Kolsky, Jersey City, N. J., for a process of treating hydrocarbon oils which comprises reacting the hy-



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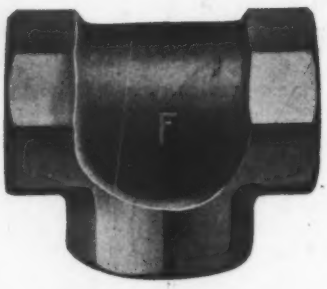

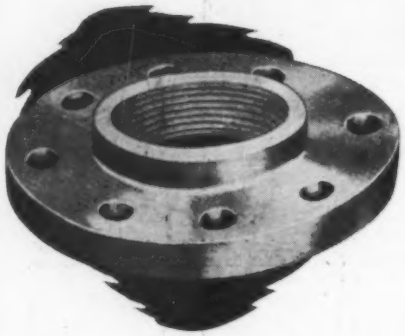

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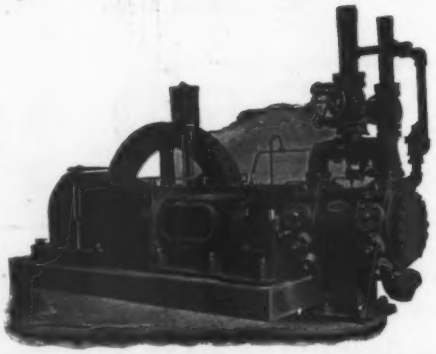

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drocarbons with an ammounium salt in the presence of finely divided metal that will react to evolve hydrogen and free ammonia at a temperature between 300 degrees and 800 degrees F., withdrawing the low boiling point hydrocarbons thus formed, and controlling the pressure of the evolved vapors to control the activity of reaction.

No. 1,599,100, granted September 7 to Francis M. Rogers and Max G. Paulus, Whiting, Ind., assignors to Standard Oil Co., Chicago, for an improvement in pyrogenetic manufacture of gasoline consisting in conducting pyrogenetic distillation of hydrocarbon oil of relatively high boiling point, condensing the gasoline containing distillate in a condenser in communication with the still and under still pressure, isolating the liquid distillate, permitting the gas dissolved in the distillate to pass out of the distillate while under pressure, and releasing the gas upon such separation with a gradual reduction of pressure.

No. 1,599,360, granted September 7 to Ingenuin Hechenbleikner and Thomas C. Oliver, Charlotte, N. C., for a method of separating petroleum sludge into its hydrocarbon and acid constituents which comprises subjecting a mixture of petroleum sludge and water to the action of an internal heat treatment at a high temperature and at a pressure greater than atmospheric in a closed pressure container having an exterior acid-proof lining and an interior refractory facing for the lining; and for an apparatus for use in treating petroleum sludge at high temperatures and at pressures greater than atmospheric to effect a separation of the same into sludge oil and sludge acid, comprising a pressure separator provided with an exterior lead lining and an interior superposed masonry lining adapted to withstand the action of the heat and the acid at the same temperatures and pressures.

No. 1,599,369, granted September 7 to Sidney W. Moss, Morristown, N. J., assignor to the De Laval Separator Co., New York, for a method of producing from crude petroleum that is contaminated with insoluble impurities, an asphaltic derivative having a minimum percentage of impurities, which comprises heating the petroleum to a distilling temperature in two stages and subjecting the petroleum between the first and second heating stages to the action of centrifugal force to eliminate therefrom the major part of its content of insoluble impurities, the temperature of the second stage being maintained until an asphaltic residue is left, whereby the deposition of salt and other imprities in the high temperature still is minimized and an asphaltic derivative produced which contains substantially less than two per cent of insoluble matter.

No. 1,599,429, granted September 14 to Alfred Oberle, Oak Park, Ill., assignor of one-half to Thomas E. Scofield, Kansas City, Mo., for a process for re-

covering light oils from heavy oils, consisting in distilling off the volatile material therefrom, passing the evolved vapors through an absorbent activated petroleum carbon, and condensing and collecting the treated vapors as distillate.

No. 1,599,629, granted September 14 to Edward L. Anderson, Long Beach, Calif., assignor of one-fourth to Edward F. Therieau, Long Beach, for an apparatus for hydrogenating oils, comprising a chamber adapted to contain a partial charge of liquid hydrocarbons and water, a rotatable shaft extending through the chamber, a plurality of disk like elements mounted on a shaft and standing partially in the liquid charge and partially in the space in the chamber above the liquid level, each of said elements including a heat and catalytic element.

No. 1,599,715, granted September 14 to Paul W. Prutzman and Paul D. Barton, Los Angeles, assignors to General Petroleum Corp., Los Angeles, for a method of producing a stable emulsion of an oil and a wet adsorbent material, which consists in mixing the oil with the plastic material for the production of an oil-continuous emulsion, and thereafter in contact with steam heating and agitating said emulsion until the phases reverse with the production of a stable water-continuous emulsion.

No. 1,599,777, granted September 14 to Ernest O. Linton, Indiana Harbor, Ind., assignor to Linton Gasoline Process Co., Chicago, for a process of removing asphalt from asphalt base oils which consists in continuously delivering such oil directly on to a heated surface with an externally heated still, maintained at a temperature sufficient to volatilize substantially all the high-boiling oils but not high enough to vaporize asphalt ingredients, the residual liquid oil and vapors therefrom flowing into the open still chamber, within which the temperature is maintained between 830 degrees and 860 degrees F., in which such residual oil flows continuously over the heated wall of the still, whereby the vaporizable constituents are freely liberated into the still spaces, removing the asphaltic residuum from the bottom of the still, and permitting all the resulting vapors to pass out together in a condenser.

No. 1,599,824, granted September 14 to Warren K. Lewis, Newton, Mass., assignor to Humble Oil & Refining Co., Houston, Texas, for an apparatus for the vacuum distillation of hydrocarbon oils, comprising a still including in a lower portion a heated receptacle for the liquid oil, in an upper portion a cooling zone, and a vapor passage connecting said receptacle and cooling zone; said vapor passage being substantially unobstructed and having a cross-sectional area adequate to permit free flow of vapors, a jacket arranged about said passage, means for passing a heated fluid through said jacket to maintain the temperature of the vapors, means for supplying a cooling fluid to said cooling zone, means for prevent-

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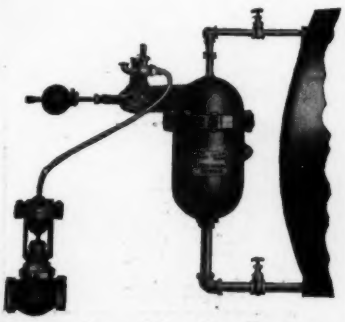

In the process of manufacture of gasoline by absorbing the gasoline in oil and subsequently separating the gasoline from the oil by distillation, it is essenital that a constant oil level in both the absorbing tank and the still be maintained.

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ing reflux to the heated receptacle of any substantial amount of condensate formed in said cooling zone, a draw-off conduit for vapors passing the cooling zone, and means for exerting suction upon said conduit.

No. 1,599,825, granted September 14 to Warren K. Lewis, Newton, Mass., assignor to Humble Oil & Refining Co., Houston, Texas, for a distillation apparatus which comprises a vaporizing receptacle, a condensing section adapted to receive vapors therefrom, a centrally apertured deflector mounted on the inner surface of said section and having walls inclined inwardly therefrom, a collector or pan spaced below said deflector and having an extent not substantially greater than that of the central aperture in the deflector, means for drawing off the condensate from the collector pan, and means for removing uncondensed vapors from the condensing section.

No. 1,599,833, granted September 14 to Francis C. Moore, and Perry Vandervort, Long Beach, Calif., for an oil refining still comprising in combination a furnace having side walls, a fire box formed between said walls adjacent their base, the fire box having fire box front and rear walls and a fire box cover extending rearwardly from the front wall, the front wall having burner openings and the box cover having an outlet adjacent the rear wall, a baffle plate positioned over said outlet extending forwardly from the rear wall, front and rear heating chamber walls, the front wall being positioned on the cover and the rear wall being positioned on the baffle plate, said walls extending between the side walls, a top forming a cover between the side walls, a top forming a cover between the side and the heating chamber front and rear walls, said top having an outlet, the side walls and the cover extending forwardly and rearwardly from the said heating chamber front and rear walls, a stack of straight pipes inserted in the heating chamber extending through the heating chamber front and rear walls and having return bends outside said walls and removable covers over the return bends fitting between the side walls and the top.

No. 1,599,854, granted September 14 to Morris C. Van Gundy, Houston, and Joseph R. Scanlin, Port Arthur, Texas, assignors to the Texas Co., New York, for a lubricant comprising a dehydrated mixture of cylinder stock and a soda soap, said cylinder stock and soap being present in about equal proportions and both being present in large amount.

No. 1,600,030, granted September 14 to Harold Orin Ballard, Bartlesville, Okla., assignor, by mesne assignments, to Doherty Research Co., New York, for a method of dehydrating petroleum oil comprising heating the oil, passing the heated oil in a continuous stream through a closed chamber, and removing emulsion from the bottom of said stream as it settles by gravity.

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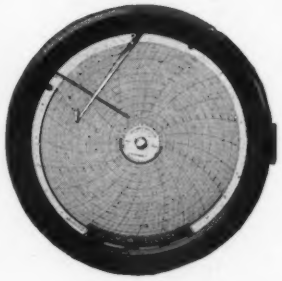

are built throughout with parts designed specially for Recording Gauges. For illustration, they have *Bourdon* springs, the same as used in our Indicating Gauges, instead of a *make-shift* spring designed for a different type of instrument.

Therefore American Recording Gauges are extremely lively, and more simple, rugged and durable. There are no fine capillary connecting tubes to the socket.

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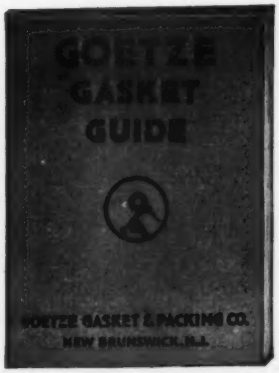

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GARLOCK 377 is a lubricated non-friction metal packing with side walls, back and cushion of frictioned asbestos cloth

The metal core is manufactured from a solid piece of non-friction metal. The Special Garlock Design procures a number of small metal surfaces so staggered as to give a pressure tight bearing on the rod. The cuts in the metal impart extreme flexibility to the packing enabling it to closely encircle the rod.

Small round concealed punchings act as emission holes for the lubricant that is retained in the many folds of the metal.

The asbestos side walls and back hold the metal in place and the folded asbestos core above the metal acts as a pusher and compensating cushion to bring the metal to the rod at an even pressure.

The ratio of wear on the bearing surface of the packing is the same at all times on account of the square construction of the metal core.

Garlock 377 is particularly recommended for service on the piston rods of main engines on steamships, deck engines, hoisting engines, steam shovels and dredges, steam hammers, kickers and steam niggers in the lumber trade and a general all around steam engine packing

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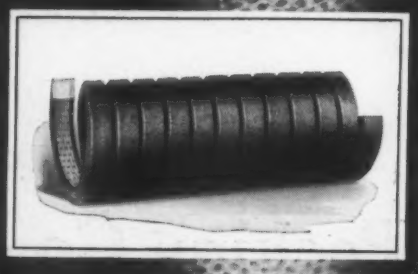

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American Cast Iron Pipe Company 6
American Paint & Supply Company 53
American Radiator Company 12
Andrews Bradshaw Company 86
American Schaeffer & Budenburg Corporation 89
Geo. B. Allan Company 77
Banner Rock Products Company ..... *
Bessemer Gas Engine Company 8
Botfield Refractories Company 9
C. F. Braun & Company ..... Inside front cover
Bristol Company 80
Burrell Technical Supply Company 88
Celite Products Company ..... *
Chestnut & Smith Corporation 67
Chicago Bridge & Iron Company 84
C. & G. Cooper Company 20
Chaplin Fulton Manufacturing Company 87
Clark Brothers Company ..... *
Curtin Mill Supply Company ..... *
Detroit Graphite Company ..... *
Edward Valve & Mfg. Company 82
Elliott Company 47
Fisher Governor Company 73
Fort Worth Laboratories ..... *
Foxboro Company, Inc. 85
Garlock Packing Company 90
General American Tank Cor Corporation 77
Goetze Gasket & Packing Company 89
Graver Corporation 59
Greene Bros. 88
Griscom-Russell Company 51
A. L. Henderer's Sons 81
Hills-McCanna Company 65
Johns-Manville, Inc. 61
Kaw Steel Construction Company ..... Front cover
M. W. Kellogg Company 49
Kerotest Mfg. Company 22
Lagonda Manufacturing Company ..... *
Liberty Manufacturing Company 4
Walter E. Lummus Company ..... *
Lunkenheimer Company 13
Maintenance Engineering Corporation 86
W. N. Matthews Corporation ..... *
A. Y. McMontald Manufacturing Company ..... Back cover
Arthur G. McKee Co. ..... *
Metallo Gasket Company 87
Meriam Company ..... *
Metric Metal Works 16
Lee B. Mettler Company 85
Midwest Piping & Supply Company 63
Mine Safety Appliance Company 83
National Meter Company 81
North American Car Company 7-55
Oil Conservation Engineering Company 5
Pennsylvania Forge Company 10
Pioneer Tank & Boiler Company ..... *
Pittsburgh Steel Products Co. 38-39
Plibrico Jointless Firebrick Company 41-42
Power Piping Company 79
Power Plant Equipment Co. 71
Power Specialty Company 17
Premier Mill Corporation ..... *
Pulmosan Safety Equipment Company 76
Quigley Furnace Specialties Company 57
Refinery Supply Company 72
Roto Company 83
Southern Cornice Works 79
Southwestern Engineering Corporation 11
Sun Company 15
A. O. Smith Corporation 18
Standard Engineering Company 76
C. J. Tagliabue Manufacturing Company 88
The Texas Company ..... Inside back cover
Texas Fire Brick Manufacturers' Assn. 74
United Iron Works ..... *
Universal Oil Products Company 44-45
Vilter Manufacturing Company 86
Henry Vogt Machine Company 14
Walsh Fire Clay Products Company 75
Ward Chemical Company 75
Westcott & Greis ..... *
Western Iron & Foundry Co. 78
Widdell Engineering Company ..... *
Williams, Brown & Earle, Inc. 88
D. T. Williams Valve Company 3
Winkler & Koch 69
W-K-M Company ..... *
Woodward, Wight & Company, Ltd. ..... *
York Manufacturing Company 71

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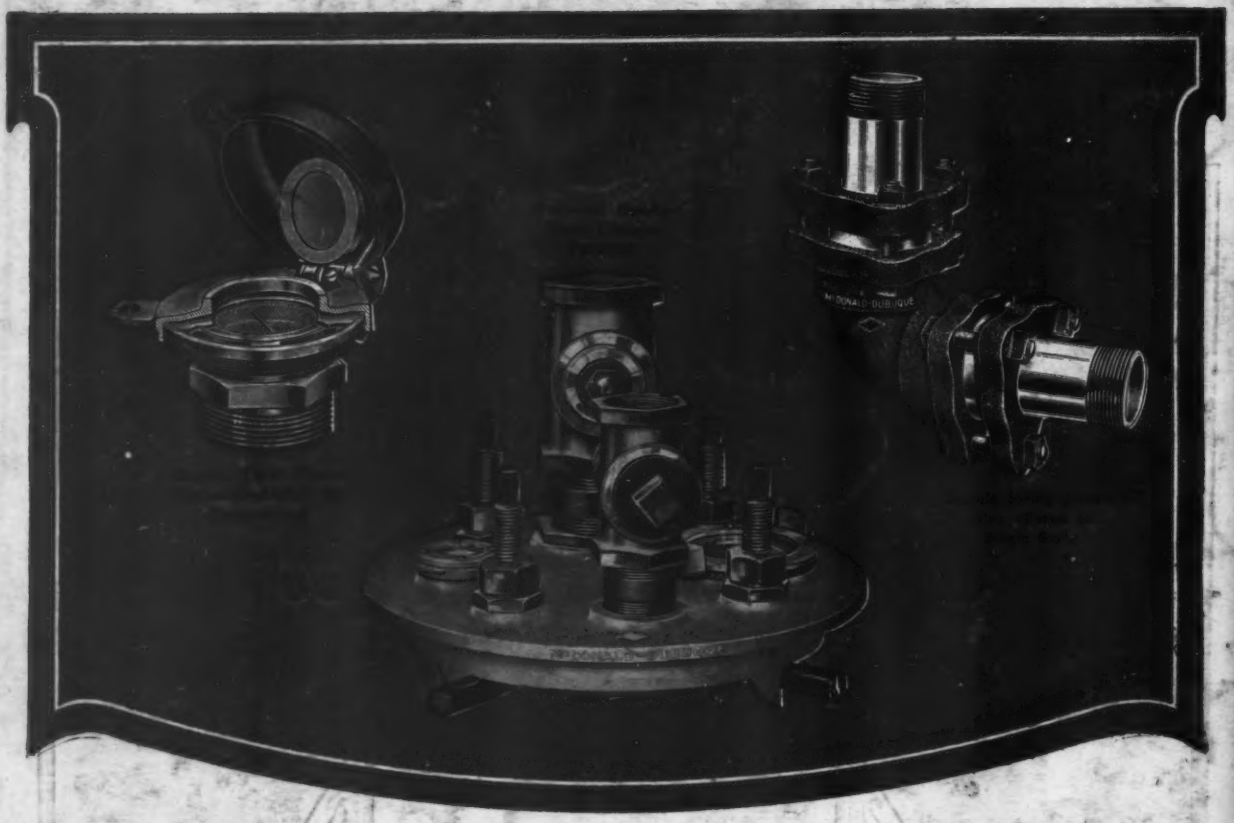

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